AVIATION WEEK

50 CENTS

NEW GUARDIAN OF THE NORTH
HERE'S the newest jet designed for defense of the western world.
She's an all-Canadian fighter called the AVRO CF-100.
The big all-weather ship will soon be guarding the polar routes. Powered by two Orenda engines built in Canada, the CF-100 can do well over 600 m.p.h.
The Honeywell pilot engineer you see here climbing aboard this test model of the CF-100, pictured outside the Honeywell hangar in Minneapolis, is about to check the ship's Honeywell Control installations. These include a yaw axis damper system, a complete fuel measurement system with a new totalizing feature, and a classified temperature indicating system that is used in the CF-100's rocket armament.
Moreover, test installations of Honeywell's new E-11 jet fighter autopilot are now being made.
The CF-100 is another example of how Honeywell works with airframe manufacturers—both U. S. *and* Canadian—to produce better airplanes. We shall continue to provide this kind of cooperation—because *automatic control* is such an important part of aviation progress. And *automatic control* is Honeywell's business.
H
MINNEAPOLIS
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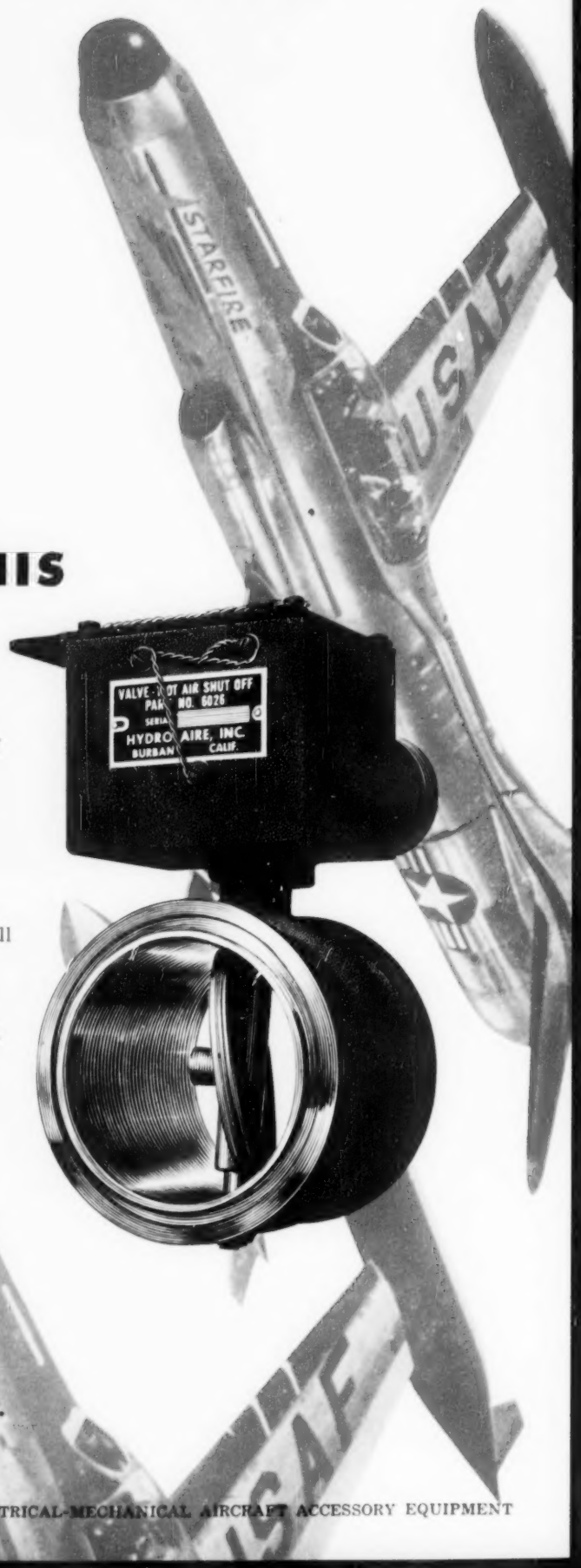
RESEARCH HATCHED THIS BUTTERFLY!

Out of Hydro-Aire's Research Laboratory, one of the finest in the nation, constantly come new and improved hot-air valves of many types—solenoid pilot valves—pneumatically operated valves—motor operated butterfly valves.

The fact that Hydro-Aire's butterfly valves, like all Hydro-Aire products, fly directly from the drafting board to the research chamber is but another reason why every fighter, every bomber, every transport is Hydro-Aire equipped. It is the sign of dependability—proved engineering and proved products, backed by one of America's most efficient production organizations.



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BURBANK, CALIFORNIA

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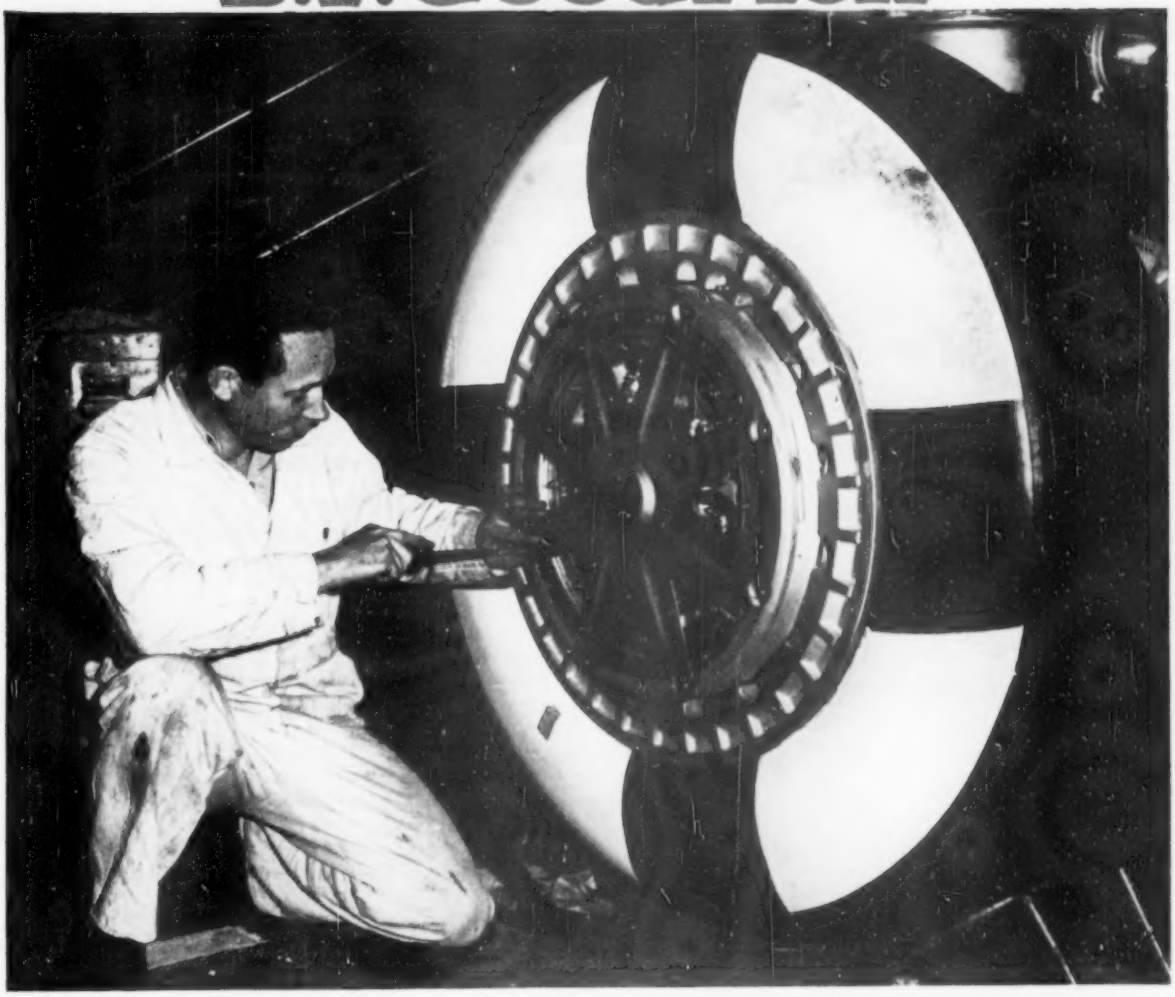
B.F.Goodrich



B-52's bicycle gear uses B.F. Goodrich wheels, brakes

LANDING GEAR on the B-52 Stratofortress has to bring in safely one of the U. S. Air Force's largest bombers. Boeing decided upon eight wheels in a bicycle arrangement. The same B. F. Goodrich 60,000 lb. wheel proved on the B-47 is used. This wheel has taken test loads up to 300,000 lbs.

B. F. Goodrich Expander Tube brakes have a new kind of brake block. No rivets are used. The brake lining is cemented onto a light magnesium shoe. The braking action applies equal pressure over the full circle of the drum to give greater power, to distribute the load better. The narrow-cavity expander tube gives more braking pressure with less fluid.

Landings are safer and smoother. BFG brakes respond smoothly and quickly to minimum pressure, take emergency overloads better, cannot lock or grab. And they last longer because more of the brake lining is used. Elimination of rivets permits full, positive braking down almost to the metal backing.

The B. F. Goodrich Type VII tires take 178 lbs. inflation, yet are light in weight. All-nylon cord construction increases tire life, reduces maintenance. (Black and white markings on tire pictured above are for photographic determination of speed calculations.)

Other aviation products to come from BFG's research and engineering include: heated rubber, pneumatic and electric De-Icers, inflatable seals, Avtrim, Pressure Sealing Zippers, Plastilock adhesives, fuel cells, Rivnuts, accessories. *The B. F. Goodrich Co., Aeronautical Division, Akron, Ohio.*

B.F.Goodrich

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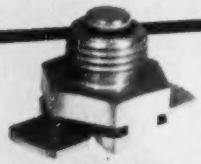
DROP TANK VALVE
Sealing or Non-Sealing

OXYGEN COUPLER
AN 6009-2A or 1B

PRESSURE RELIEF VALVE
Line Mounted



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Aviation Week

ABP Member ABC

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43,915 copies of this issue printed

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Editorial Office: 330 West 42nd St., New York 36, N. Y. Phone Longacre 4-3000, or (night) 4-3035; National Press Bldg., Washington 4, D. C., Phone National 3414. *Domestic News Bureaus:* Atlanta 3, 1321 Rhodes-Haverty Bldg.; Chicago 11, 520 N. Michigan Ave.; Cleveland 15, Hanna Bldg.; Detroit 26, Penobscot Bldg.; Los Angeles 17, 1111 Wilshire Blvd.; San Francisco 4, 68 Post St.; Houston 25, 1303 Prudential Bldg. *Correspondents* in more than 60 major cities.
Foreign News Bureaus: London, Paris, Frankfurt, Tokyo, Manila, Rio de Janeiro, Mexico City. *Correspondents* in more than 59 major cities.
Aviation Week is served by PRESS ASSOCIATION, INC., a subsidiary of Associated Press.

Robert W. Martin, Jr.
PUBLISHER

J. G. Johnson, *Business Manager;* Catherine Miner, *Research and Marketing;* Sales Representatives: J. C. Anthony, *New York;* H. P. Johnson, *Cleveland;* L. J. Biel, *Chicago;* W. E. Donnell, *St. Louis;* E. P. Blanchard, Jr., *Boston;* James Cash, *Dallas;* R. C. Maultsby, *Atlanta;* R. F. Dorland, Jr., *San Francisco;* C. F. McReynolds, *Los Angeles;* W. S. Hessey, *Philadelphia.* Other sales offices in *Pittsburgh, Detroit, London.*

January 12, 1953 AVIATION WEEK Vol. 58—No. 2
Member ABC and ABP

Published weekly by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder. **Publication Office: 99-129 North Broadway, Albany 1, N. Y.**
Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 W. 42nd St., New York 36, N. Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice-President, Publications Division; Ralph R. Smith, Vice-President and Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.
Subscriptions: Address correspondence to AVIATION WEEK—Subscription Service, 99-129 North Broadway, Albany 1, N. Y., or 330 W. 42nd St., New York 36, N. Y. Allow ten days for change of address.
Subscriptions are solicited only from persons having a commercial or professional interest in aviation. Position and company connection must be indicated on subscription orders.
Single copies 50¢. Subscription rates—United States and possessions, **$6 a year; $9 for two years; $12** for three years. Canada, $8 a year; $12 for two years; $16 for three years, payable in Canadian currency at par; other Western Hemisphere, $10 a year; $16 for two years; $20 for three years. All other countries $20 a year; $30 for two years; $40 for three years. Entered as second-class matter, July 16, 1947, at the Post Office at Albany, N. Y., under Act of Mar. 3, 1879. Printed in U. S. A.

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The plane

that helped

win the war

now helps

win the peace

—the Douglas C-54

Last August nearly 4,000 Moslem pilgrims bound for Mecca were stranded in Beirut 800 miles from the holy city.

In one of the finest demonstrations of international good will, the Department of Defense provided a "magic carpet" in the form of the Military Air Transport Service to speed these pilgrims on their way.

Fourteen U.S. Air Force Douglas C-54s roared into Beirut from Europe and Tripoli and then flew the 12-hour shuttle to Jidda (near Mecca). Four days later the last pilgrim arrived at Jidda with two hours to spare.

The performance of the rugged C-54 on this occasion was in keeping with the history of this great airplane. For it was the C-54 which flew billions of transport miles during the war and performed so nobly on the "Berlin Airlift."

Again the C-54 proves Douglas leadership in aviation. Planes which can be produced swiftly and in quantity, *to fly farther and faster with a bigger payload*, are a basic Douglas concept.

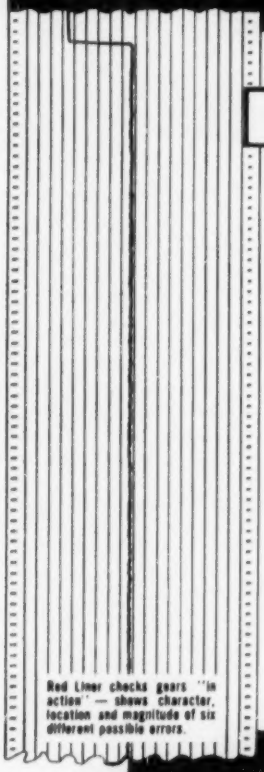
Depend on *DOUGLAS* **First in Aviation**

Proven Accuracy for the Aviation Industry

Sier-Bath PRECISION GEARS

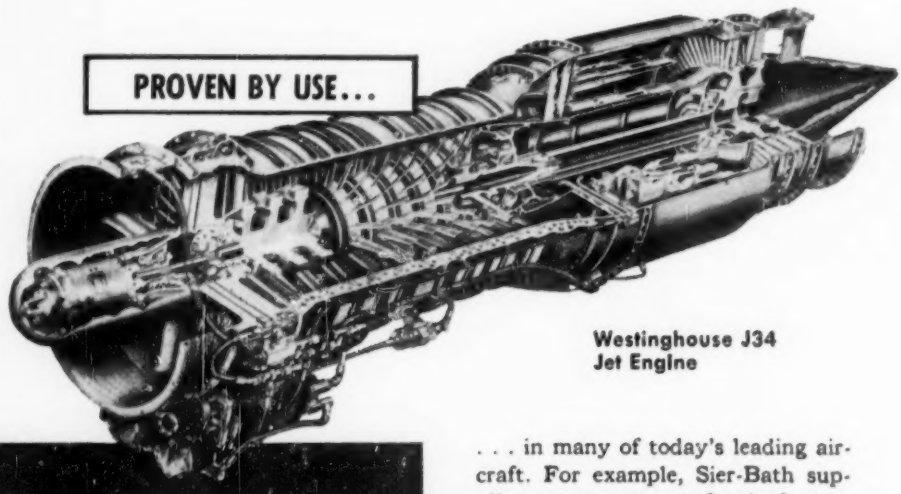
PROVEN BY TEST...

. . . on the latest gear checking equipment. Red Liner charts (left), Lead Measuring charts and Involute Tooth Form charts *prove* the accuracy of Sier-Bath Aircraft Quality Gears before they leave the plant.



Red Liner checks gears "in action" — shows character, location and magnitude of six different possible errors.

PROVEN BY USE...



Westinghouse J34 Jet Engine

McDonnell XF-88a "Voodoo"

. . . in many of today's leading aircraft. For example, Sier-Bath supplies gear components for the famous Westinghouse J34 Jet Engine . . . which powers the two modern McDonnell Aircraft Corporation planes shown at left.

McDonnell F2H-2 "Banshee"

Founded 1905 Member A.G.M.A.

Sier-Bath GEAR and PUMP CO., Inc.

9262 Hudson Boulevard, North Bergen, N. J.

Also manufacturers of Screw and "Gearex" Rotary Pumps, and Flexible Gear Couplings

NEWS DIGEST

Domestic

Strategic Air Command set a new flying safety record in 1952—18 plane accidents per 100,000 hr. flown, a 40% decrease over the 1951 rate. The new mark was achieved despite a 17% increase in flying time last year.

U. S. has lost 1,683 planes in Korea since start of hostilities until Dec. 1, 1952, USAF, Navy and Marine Corps records disclose. Air Force lost 329 jet planes and 338 piston types and claims destruction of 660 enemy aircraft. Navy and Marines lost 1,016 planes while destroying 92 Communist aircraft during the same period.

Harry Whitcombe, Davis, Calif., has been elected president of the Flying Farmers, Inc., of Calif., for 1953. Forest Fiorini, of Turlock, was named vice president and Bert Noble, Winters, was elected secretary-treasurer.

Series of one-day work stoppages is being considered at Boeing Airplane Co.'s Seattle and Renton, Wash., plants by members of Seattle Professional Engineering Employes' Assn. to strengthen demands for a new contract. Boeing has offered a 6% wage increase and revised overtime schedules but the association has rejected the plan, reportedly because overtime revisions would not be retroactive. The engineers' old contract expired July 1.

Convair 340 production has been accelerated to up 1953 delivery schedules to eight planes monthly. The San Diego firm delivered 33 340s in 1952. Toward the end of 1953, a 33% increase in T-29 production is planned. New models planned are the T-29C navigator trainer with a new type P&WA R2800 engine and the T-29D bombardier trainer. First turboprop-powered R3Y flying boat is scheduled for delivery late this year.

Robert Ramspeck resigned as chairman of Civil Service Commission Dec. 31. Washington observers say the former House Democratic Whip and ATA executive vice president is assured a top job with Eastern Air Lines if he wants it. Eastern president E. V. Rickenbacker temporarily withdrew from ATA last year because the directors refused to appoint Ramspeck to succeed E. S. Land as ATA president. Ramspeck lunched last week with Eastern vice president Leslie P. Arnold in Washington.

NEW PRESIDENT of the Aviation Distributors and Manufacturers Assn. L. W. Trees (right) receives the gavel of his new office from retiring ADMA president George W. Jalonic of Southwest Airmotive Co., Dallas, Tex. Trees is with Scintilla Magneto Division of Bendix Aviation Corp., Sidney, N. Y. Looking on are ADMA vice presidents Lawrence F. Zygmunt (left) of General Aircraft Supply Co., Detroit and James Riddle, National Aeronautical Radio Corp., Ambler, Pa. Elections were held during the association's 10th annual meeting at Miami Beach, Fla.

Charles F. Willis, Jr., Roslyn, L. I., N. Y., has been chosen to be special assistant to Sherman Adams of New Hampshire, assistant to President-elect Eisenhower in the new administration. Willis' extensive aviation experience includes running former cargo nonsked, Willis Air Service, and operation of Willis-Rose Corp., airline service firm.

Financial

Pacific Airmotive Corp., Burbank, Calif., reported unaudited sales for the fiscal year ended Nov. 30 of $27.5 million, a 14.88% increase over 1951. Commercial sales for the 1952 period topped $13.4 million.

Northwest Airlines has declared a regular quarterly dividend of 28¾ cents per share on its 4.6% cumulative preference stock payable Feb. 1 to holders of record on Jan. 20. NWA has prepaid an $835,000 installment on a bank loan due Apr. 1, reducing its borrowings to $6,800,363. Carrier's pre-tax November profit was $550,441 after $469,879 credit on prior expense accruals.

International

Aer Lingus DC-3 crashed near Spernall Ash, England, while attempting a forced landing in poor visibility with both engines dead. The 25 aboard escaped serious injury.

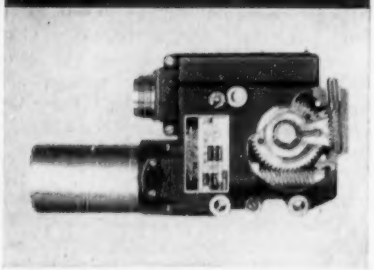
British Overseas Airways Corp. has offered to let Qantas Empire Airways, Australia, purchase six of the 26 Bristol Britannia turboprop airlines BOAC has on order. This offer would permit Qantas to get the Britannias at least a year sooner than if it took its normal place on the delivery list. The move is believed to be an effort by BOAC to speed up British 'round-the-world jet air service.

British European Airways Corp. Vickers Viking hit a beacon pylon while approaching for a landing at Belfast, Northern Ireland, Jan. 5, killing approximately 27 of the 35 aboard.

"Super priority" rating has been given by British Ministry of Supply to production of DH Comet jet transport and Vickers Viscount and Bristol Britannia turboprop airliners to speed deliveries and ". . . attract foreign operators to change over to British types." Military types having the same production rating are: English Electric Canberra, two Marks of the Hawker Hunter, Gloster Javelin, Supermarine Swift, Vickers Valiant, Fairey Gannett, Avro Vulcan and Handley Page H. P. 80.

KLM Royal Dutch Airlines C-54 crash-landed 20 mi. north of Dhahran air base, Saudi Arabia, but all 56 passengers and 10 crew members were uninjured. Rescue was handled by USAF's Military Air Transport Service. Plane purportedly was forced down by lack of fuel.

Jato Release on Republic's F-84 AIRBORNE Actuated



The R-424 actuator (R-450 type) jettisons six Jato bottles after take off. The R-424 winds cables on a drum and pulls the pins

This cutaway of Airborne's Model R-450 actuator shows the externally adjustable positive stops which, in conjunction with torque-limiting switches, provide accurate positioning at both extremes of travel. The limit may be at any value to 270°.

Projection of the splined output shaft, on both sides of the actuator, helps adapt the model R-450 to any application. The weight of this unit, with radio noise filter, is 2.7 pounds—the speed, at 26 volts and 250 pound-inch load, is 5 rpm.

See our insert in the I.A.S. Aeronautical Engineering Catalog for details on this and other Airborne actuators.

AIRBORNE
ACCESSORIES CORPORATION
1414 Chestnut Avenue Hillside 5, New Jersey

AVIATION CALENDAR

Jan. 12-15—Mid-winter conference of American Management Assn., Hotel Statler, Los Angeles.

Jan. 12-16—Annual meeting and engineering display of Society of Automotive Engineers, Sheraton-Cadillac Hotel, Detroit.

Jan. 13-30—Fifth Institute of Industrial Transportation and Traffic Management, American University, Washington, D. C.

Jan. 14-16—AIEE-IRE-NBS Conference on High Frequency Measurements, Statler Hotel, Washington, D. C.

Jan. 15-16—Fifth Illinois Custom Spray Operators Training School, University of Illinois, Urbana, Ill.

Jan. 19-23—Plant Maintenance Conference, Public Auditorium, Cleveland, O.

Jan. 19-23—Winter general meeting of the American Institute of Electrical Engineers, Hotel Statler, New York, N. Y.

Jan. 23—National Fire Protection Assn. Committee on Aviation and Airport Fire Protection, Hotel Martinique, New York, N. Y.

Jan. 26-29—21st Annual Meeting of Institute of Aeronautical Sciences, Hotel Astor, N. Y. Honors Night dinner Jan. 26.

Feb. 10—Second seminar on industrial lubrication engineering, American Society of Lubrication Engineers, Bellevue-Stratford Hotel, Philadelphia.

Feb. 12-13—National Aviation Education Council annual meeting, Atlantic City, N. J.

Feb. 18—New York Section of the Instrument Society of America, Hotel Statler, New York, N. Y.

Feb. 18-19—Eighth Annual Conference of the Society of Plastics Industry, Reinforced Plastics Division, Shoreham Hotel, Washington, D. C.

Mar. 10-11—Eleventh Annual Conference, Society of the Plastics Industry Canada, Inc., General Brock Hotel, Niagara Falls, Canada.

Mar. 25-27—National Production Forum of the SAE, Hotel Statler, Cleveland, O.

Mar. 31-Apr. 2—First International Magnesium Exposition, National Guard Armory, Washington, D. C.

Apr. 4-12—Second Annual International Motor Sports Shows, Grand Central Palace, New York, N. Y.

Apr. 20-23—Aeronautic Production Forum, National Aeronautic Meeting and Aircraft Engineering Display (SAE), Hotel Governor Clinton and Hotel Statler, New York, N. Y.

May 11-13—IRE National Conference on Airborne Electronics, Dayton Biltmore Hotel, Dayton, O.

May 18-22—Fifth National Materials Handling Exposition, Convention Hall, Philadelphia.

June 9-11—Second International Aviation Trade Show, Hotel Statler, New York, N. Y.

Sept. 7-13—1953 SBAC Coronation Year Flying Display, Farnborough, Hampshire.

PICTURE CREDITS

7—Stephen Blake; 9—North American Aviation; 16—Republic Aviation Corp.; 20-21—NACA; 34—McGraw-Hill World News; 52—(top) Gottscho-Schleisner; 82—AA; 83—James La Vake.

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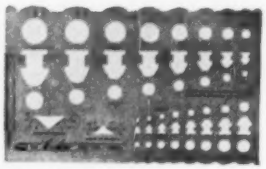

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CATAPULTED – Remarkable photo (left) catches a North American XFJ-2 Fury being catapulted off the USS Coral Sea. Nose wheel is over the edge of the big carrier's deck. Released catapult sling can be seen just ahead of ne main wheels. This and the photos below were taken during carrier qualification trials of two XFJ-2s from the Naval Air Test Center, Patuxent, Md. The Navy's Fury is similar to the USAF F-86 Sabre but has folding wings and four 20-mm. cannon in place of Sabre's six .50-cal. machine guns. Production Furies are being turned out at Columbus, Ohio.

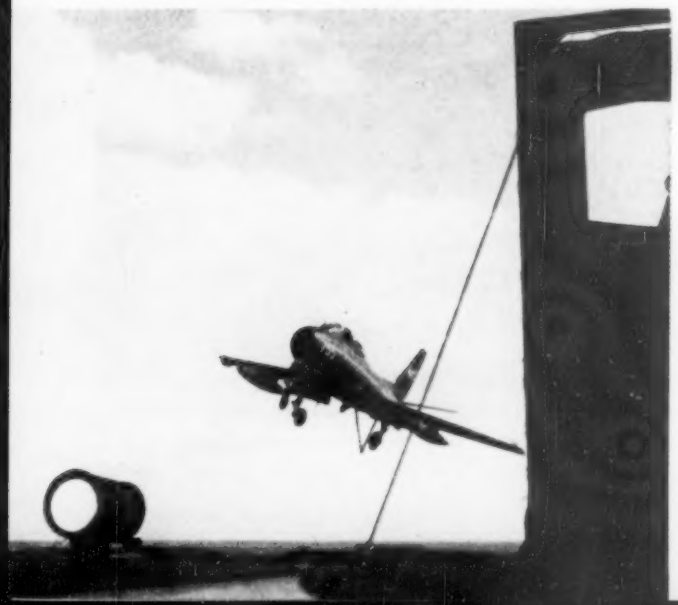
North American Fury Tries Its Sea Wings

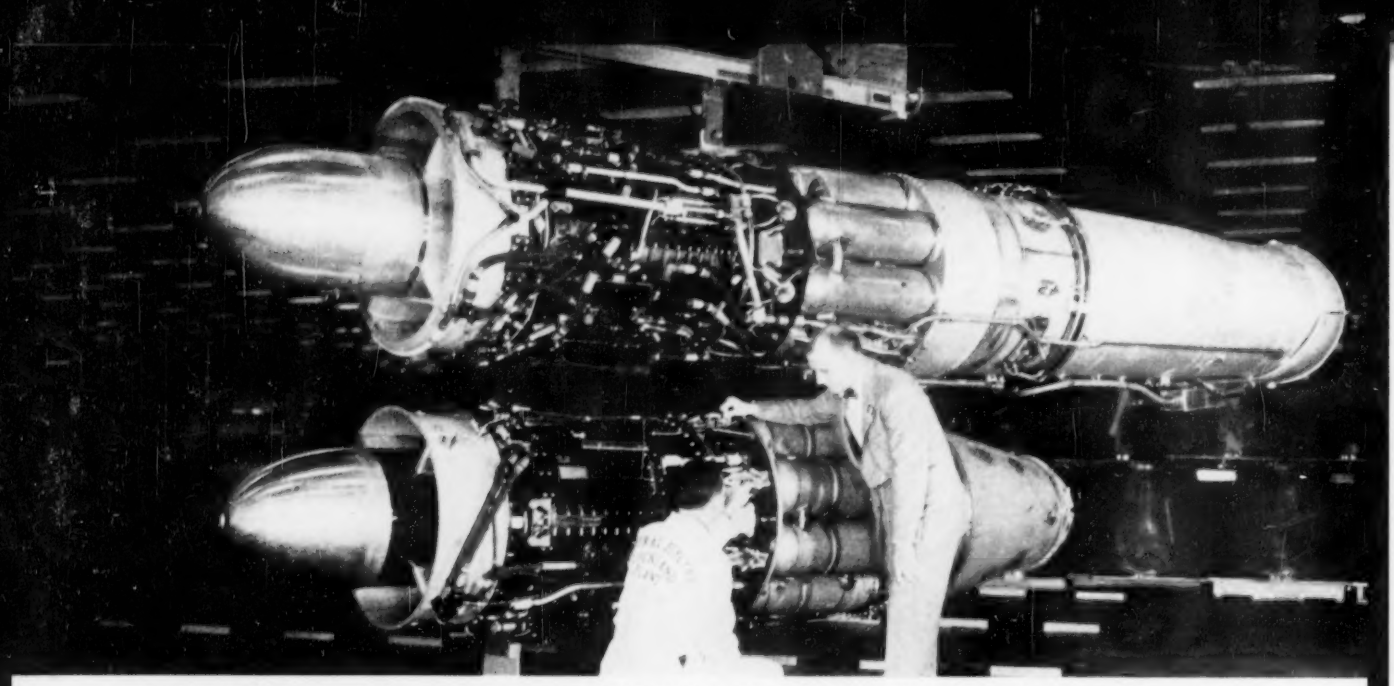
BEING READIED—The two XFJ-2 Furies, one still perched on the Coral Sea's outboard elevator (left), being prepared for flight by their plane handlers.

LANDING—V-type deck arresting hook trailing, a Fury is guided by landing officer into landing on the carrier.

TOWING A FURY—Deck tractor tugs an XFJ-2 off the elevator which has just hoisted the plane to deck level. Above and behind the Fury hovers a Piasecki HUP-1 rescue copter.

HOOKED—XFJ-2 has been halted by engaged arresting wire. Note crash barrier across the deck in front of plane.





USAF SPEED CHAMP, G-E J47 is shown with afterburner and without. Even without afterburner, the engine develops over 5200 pounds of thrust

G-E J47 Powers USAF Planes to Two Speed Records

North American F-86D Sets New World Mark, Boeing B-47 Shatters Honolulu–San Francisco Record

Still helping re-write the aviation record book, General Electric's J47 turbojet powered a North American F-86D Sabre and a Boeing B-47 to new speed records within the space of one week. Making four low level runs on the three-kilometer Salton Sea, California course, the F-86D (with afterburner) racked up an average speed of 699.9 mph—a new world's speed record. Just a few days later, a six-jet Boeing B-47 (without afterburners) set an unofficial record for the Honolulu-San Francisco run of 4 hours, 32 minutes.

The F-86D and B-47 engines are first cousins to the J47's which power the Sabres in Korea. The afterburner version is equipped with all-electronic control which automatically regulates fuel through both the engine and the jet exit area. This means optimum performance under all conditions with much less pilot attention.

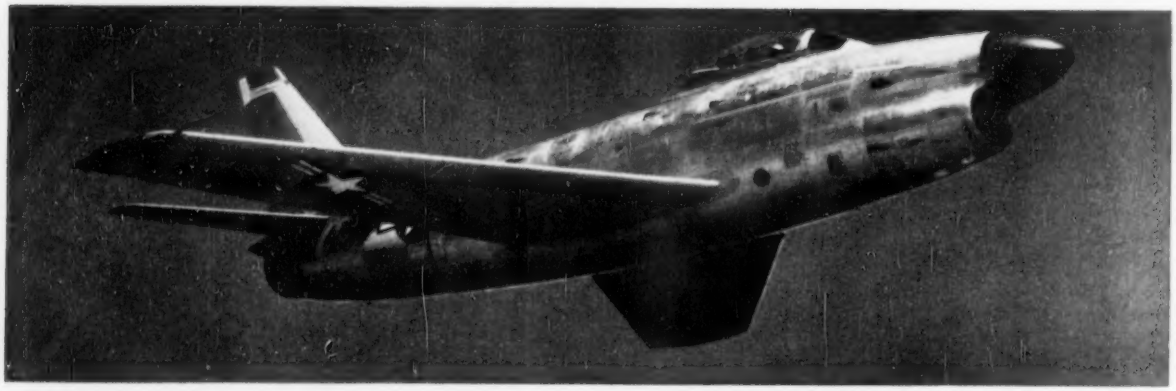
Designed and built by General Electric, the world's largest known manufacturer of jet engines, the J47 is assured peak performance by G.E.'s world-wide service engineering organization. This group provides on-the-spot technical assistance and supervision to users of the J47 no matter where they may be.

Tops in speed at home, tops in combat performance abroad, the J47 is America's top mass-produced jet engine. General Electric Company, Schenectady 5, N. Y.

210-66

You can put your confidence in—

GENERAL ELECTRIC



RECORD RUN of F-86D was made under rules of the Federation Aeronautique Internationale and the N.A.A. Average speed: 699.9.

WHO'S WHERE

In the Front Office

Ralph L. Collett has been appointed vice president and assistant general manager of Kaiser Metal Products' Aircraft Division, Bristol, Pa., currently producing fuselage sections for Republic F-84F and Martin B-57A. Collett started with Kaiser in 1942.

William E. Judd has been designated assistant to the president of Stewart-Warner, Chicago. He succeeds **Leonard L. Robb**, promoted last year to wholesale sales chief of S-W instruments and Alemite lubrication equipment. **William V. Ryan** succeeds Judd as general sales manager, South Wind Div.

William H. Klenke Jr. has joined Packard Motor Car Co. as assistant to vice president in charge of defense operations, Detroit. Klenke formerly was general sales manager of Consolidated Vultee Aircraft Corp.'s Stinson Division and W. L. Maxson Corp., N. Y. C.

Changes

Ernest Wilbanks has been named administrative assistant of California Central Airlines' traffic and stations, Lockheed Air Terminal, Burbank, Calif.

Frank W. Davis has been appointed to the staff of Consolidated Vultee Aircraft Corp.'s vice president for engineering, San Diego Division. He formerly was Convair's assistant chief engineer for research and development.

Delos P. Thurber has been promoted from chief pilot to flight operations manager of Philippine Air Lines.

George Scott, commercial aviation pioneer, has been named assistant to Braniff International Airways' general traffic and sales manager.

George H. Warfel has joined Southwest Airways as radio, communications director.

Gordon F. Maxwell has been appointed manager of Pan American World Airways' Pacific Alaska Division.

C. W. Merritt is new field engineer for Weber Aircraft Corp.'s product development department at Burbank, Calif.

John V. Roberts has joined Short Bros. & Harland, Ltd., as assistant helicopter designer at the Belfast, No. Ireland, plant.

Jorge De Brigard has been promoted to European general representative for Avianca, Colombian National Airways.

Honors and Elections

Vice Adm. Emory S. Land has been re-elected president of the Air Transport Assn. Other ATA officers named were **Milton W. Arnold**, vice president of operations and engineering; **J. D. Durand**, secretary; **Stuart Tipton**, general counsel, and **J. F. Hinterschr**, treasurer. New members of the 10-man board of directors: **T. E. Braniff**, Braniff Airways; **John H. Connelly**, Southwest Airways, and **Robert F. Six**, Continental Air Lines.

Warren Lee Pierson, board chairman of Trans World Airlines, is beginning a two-year term as chairman of the U.S. Council of the International Chamber of Commerce.

INDUSTRY OBSERVER

► A Fairchild C-119 climbed to 30,300 ft. with a gross weight of 56,000 lb. in a recent flight near Hagerstown, Md. That is well above the cargo transport's normal ceiling of 27,500 ft. Lt. Col. E. S. Cleveland, USAF plant representative who piloted the plane to check performance of heating and oxygen equipment, said the C-119's flight characteristics were quite satisfactory at the above-ceiling level.

► Cessna Aircraft's turbine-powered L-19B liaison plane is set for a 30-hr. evaluation of engine and plane performance by an Air Force test pilot at Wichita. The pilot will test mainly characteristics of the L-19B's Boeing 502-8 turboprop in flight, cooling and fuel flow.

► Advocates of the convertiplane and compound helicopter say a Pitcairn PA-34 Autogiro 10 years ago recorded a speed of 140 mph.—better than the world's speed record for unboosted helicopter flight.

► Bell Aircraft designates its forthcoming convertiplane in the USAF-Army evaluation as the Bell Model 200. The Sikorsky convertiplane entry in the same evaluation is called Sikorsky Model S-57.

► Pratt & Whitney Aircraft reports that it expects to turn out about half its 1953 production in gas turbine engines. First two aircraft scheduled to fly with the P&WA T34 turboprop, the Douglas YC-124B and the Lockheed R7V-2, are not expected to fly until late in 1953.

► Douglas Aircraft is developing a new supersonic carrier-based bomber to succeed the A3D.

► Army is about to sign a contract for 40 more Beech Twin-Bonanzas to follow deliveries of the first 55 production planes now on order. First of the Army's original order is due for delivery this month.

► First B-47 Stratojet built by Douglas under a second-source contract flew at Tulsa during the holidays, four days before the first flight of Lockheed's B-47 at Marietta, Ga. Douglas and Lockheed both hold Air Force contracts to manufacture the Boeing-designed bomber.

► Avro Canada's new CF-100 Mark 4 night fighter—which broke through the sonic barrier in tests last month—is described as superior to the Mark 3 in power, speed, armament, maneuverability and handling. The new Canadian jet is scheduled for production this summer.

► Taxiing and flight tests are starting on the B-47 Stratojet's new swiveling bicycle gear for cross-wind landing, according to reports from Wichita. Tex Johnston, chief Boeing test pilot, is at the controls. The landing gear is believed to be the first swiveling double-truck bicycle undercarriage to be developed. Outrigger wheels at the wingtip have always been swiveled.

► USAF has begun a new series of study contracts with the aircraft industry to re-evaluate the industrial capacity required to meet Air Force's all-out mobilization requirements. Purpose is to get more realistic data than the hurried over-estimates of the 1950 Korean emergency period. Various segments of the aircraft industry will be studied in the order they reach their respective production peaks. Five contracts already have been let with manufacturers of avionic equipment.

► MATS expects to get initial deliveries of the C-131, a combination cargo and air evacuation version of the Convair 340, during the first quarter of 1954. The C-131 will be equipped with rearward-facing seats and will be for domestic operations of MATS air evacuation.

► Piasecki Helicopter Corp. is claiming a new unofficial record for its H-21 helicopter as a result of a recent flight carrying 14 passengers plus pilot on a five-mile run from the Philadelphia Airport to the plant at Morton, Pa. Piasecki claims this is the largest passenger load carried internally by any helicopter on a point-to-point flight.

Washington Roundup

The Case of Aro, Inc.

A key aviation issue due for decision early in the new Congress is whether Aro, Inc., will continue to operate the Air Force's multi-million-dollar Arnold Engineering Development Center at Tullahoma, Tenn.

► Congress tentatively has said "No." The military budget for the 1953 fiscal year, which ends next July 1, bans any payment to the corporation after Mar. 31 "unless Congress shall have directed otherwise." A move to ban payments to Aro was modified, largely at USAF pleading that this would not allow time for transition to other management.

But both Air Force and Aro are determined to fight:

• Disregarding the congressional warning, USAF renewed Aro's contract Sept. 30, explaining it wants "to present this matter to the Congress." (After long hearings before two committees and long debate on the floor of both House and Senate, Congress came up with its directive against Aro.)

• Aro's determination to keep the USAF contract for operation of AEDC is evidenced by its retention of the politically influential law firm, Arnold, Fortas and Porter.

Windfall for Stockholders?

The heart of congressional opposition: belief that Aro has been the means for a handful of stockholders to earn a fabulous return on investment for little or no contribution to its operation. The stockholders:

Sverdrup & Parcel, influential St. Louis engineering firm. Aro was incorporated by S&P as a wholly owned subsidiary, capitalized at $100,000 for the purpose of operating AEDC. Stuart Symington, former St. Louis business executive and now senator from Missouri, awarded Aro the operation contract when he was Air Force Secretary. At the request of former Undersecretary for Air John McCone, Aro's capitalization was expanded to $150,000, to include:

Stephen Bechtel, a friend of McCone's from college days and his associate in several business enterprises, who, with members of his family, subscribed a total of $30,000.

David R. Calhoun, Jr., director of Emerson Electric Co. (of which Symington was president and chairman of the board before coming to Washington), who subscribed $5,000. Also president and director of St. Louis Union Trust Co. and director of Union Electric Co., Calhoun described himself to investigators as "a good friend of Mr. Symington."

J. Wesley McAfee, president of Union Electric and director of St. Louis Trust Co., who, with members of his family, subscribed $15,000.

The return on the $150,000 investment of these stockholders:

• **$23,474** for the period of the first Aro contract, from Apr. 22, 1950, to Oct. 1, 1951.

• **$95,000** for the period of the second contract, from Oct. 1, 1951, to Oct. 1, 1952.

This amounts to more than $118,000—or a return of nearly 80% in less than two years.

USAF and Aro have protested the figuring of Aro's return in relation to capital investment. Instead, it is maintained, it should be considered as similar to a legal fee.

General Accounting Office doesn't go along with this reasoning.

Maj. Gen. F. O. Carroll, former commanding officer of AEDC, told investigators the stockholders, other than Sverdrup & Parcel, "contributed nothing to the operation of AEDC" to his knowledge.

Other Objections

Congressmen also object that:

• Aro's fees are geared to its operating budget ($774,502 under the first contract and $2.6 million under the second), meaning that the higher its costs the higher the fee. By 1956, it is estimated the operating budget for AEDC will approximate $10 million. At the present rate of Aro's fees, this would earn an annual fee to the firm of $330,000 a year, or a return of more than 200% annually on capitalization.

• One of Aro's major tasks at present is to pass on S&P designs for AEDC facilities (S&P is under contract to design the facility), and the question whether Aro, two-thirds owned by S&P, can properly judge that performance.

Top Lights

Key personalities figuring in the Aro issue are:

Sen. Symington. Disregarding a recommendation that AEDC be operated by a non-profit corporation formed especially for the purpose, he unilaterally decided on a "for-profit" operation by Aro. Recommendation of a committee of experts, headed by Prof. John Markham of Massachusetts Institute of Technology, was submitted to Symington Apr. 12, 1950. Three days later Aro was incorporated, and on Apr. 22 USAF gave the firm its first contract.

Sen Albert Gore. As member of the House, campaigning for the Senate, he launched the attack on Aro which resulted in the congressional ban on payments to the firm. Since the outset, the Tennessee senator has played down Symington's participation. It is understood now he would prefer to keep out of the Aro review.

Steve Leo, former Director of Information for USAF. Question is raised whether Leo's employment by S&P as vice president at a salary varying from $17,500 at the outset to $22,500, plus a special stock concession, influenced the letting of USAF's contract to Aro. Reaching no conclusion, General Accounting Office simply noted that S&P "first seriously approached" Leo concerning employment "while the latter was still with the Department of Air Force."

Dan Kimball, secretary of Navy. Drawing no conclusions, GAO noted that, as Assistant Secretary of Navy in 1950, he resolved Navy objections to "significant design changes" at AEDC after Aerojet Engineering Corp. was approached to participate in Aro by S&P representatives. Aerojet is 80% owned by General Tire and Rubber Co., of which Kimball formerly was vice president, according to GAO.

Rep. Dewey Short. The Missouri congressman, Aro's leading proponent on Capitol Hill, this year became chairman of the House Armed Services Committee, with jurisdiction over the Aro matter. He tried unsuccessfully last year to strike out the ban on Aro payments.

—Katherine Johnsen

AVIATION WEEK VOL. 58, NO. 2
JANUARY 12, 1953

Two-Year Aircraft Sales Boom Predicted

- **Defense Mobilizer says deliveries of military planes to reach peak of 12 million lb. per month in 1954.**
- **Aircraft industry production already four times the pre-Korea output, despite bottlenecks in program.**

By Robert Hotz

Sales volume of the aircraft industry will continue to rise during the next two years. That is the significant conclusion to be drawn from a report by Defense Mobilizer Henry J. Fowler.

He said the monthly total of airframe weight delivered will increase steadily until the end of 1954 despite the fact that aircraft deliveries will reach their numerical peak this spring.

This steady increase in airframe weight is accounted for by the preponderance of heavy, expensive transports and fighters scheduled for delivery during the next two years in contrast to lighter and less expensive fighter types that now comprise the bulk of aircraft deliveries. Airframe weight is a more accurate measure of sales volume than numbers of aircraft.

Fowler noted in his eighth quarterly report to President Truman that aircraft deliveries had reached nearly 1,000 a month by the end of 1952.

Industry observers estimate the deliveries involve a monthly output of about 9 million airframe pounds. Numerical deliveries are expected to hit a peak of about 1,000 planes a month this spring, but airframe weight will continue to rise more than 20% to a peak of about 12 million lb. a month in 1954.

► **Four-Fold Increase**—Total aircraft production has increased to four times the pre-Korean rate of mid-1950, and deliveries of jet aircraft have increased fivefold during the past two and a half years, Fowler reported. Jet engine production has doubled since 1951, and the value of avionic and electronic equipment produced is about eight times that of the pre-Korean level.

But jet engines and avionic equipment still are the two major bottlenecks in the aircraft production program, and further expansion of the productive capacity in both fields will be necessary to meet all-out mobilization requirements.

Fowler said the USAF's three all-weather fighters currently in production—the North American F-86D, the Lockheed F-94C and the Northrop F-89D—have been "held up by engineering difficulties with fire control systems and newly developed jet engines."

Here are highlights of the Fowler report pertaining to the aircraft industry:

• **Jet engines.** "The one jet engine production program that has fallen seriously behind schedule is the J65 Sapphire. . . . Both the Air Force and the manufacturer (Curtiss-Wright) feel they were overly optimistic in their estimate of how long it would take to re-engineer this British-designed (Armstrong-Siddeley Motors Ltd.) jet type for American production. Design difficulties are not yet completely overcome. . . .

"Jet engines, which are now being produced at a rate double that of a year ago, are still a relatively new product and technological progress is rapid. The power of today's jet engines is five times that of the first jets used in military aircraft, and far more powerful engines are being developed. New models such as the J57 (P&WA) and J65 (C-W) also consume less fuel per pound of thrust than any of our present engines in quantity use. The new models use less of the scarce high temperature alloys."

• **Guided missiles.** Dollar value of deliveries of guided missiles is currently running more than double the third-quarter deliveries in 1950. But technical difficulties, design changes, lack of technical personnel and other production problems continue to retard quantity output.

"Guided missiles are still largely in the stage of research, development, or limited assembly-line production. Substantial increase in deliveries depends on achieving and maintaining reliability performance in missiles that can be produced with production-line techniques."

• **Avionics.** "The advance in the use of electronic equipment throughout the armed forces constitutes a technological revolution that is still in its early stages. Of the various types of electronic equipment and communications devices now in production, 95 are of new design, developed and put into production since Korea.

"The electronics industry has consequently been forced to expand and modify its facilities extensively and numerous production delays have occurred."

• **Aircraft fuel.** "High octane aviation gasoline used in piston-engined aircraft will probably continue in tight supply for the next 18 months. The gap between demand and supply of aviation gasoline can now be filled largely by blending of higher-cost ingredients diverted from other uses. But it is clear that this and other expedients, even though pressed to the limit, would not meet the wartime needs for aviation gasoline. More production capacity is needed.

"One of the factors that makes this problem difficult is that probably in less than a decade the continued shift from piston to jet engines among military aircraft will have wiped out a substantial portion of the requirements which may prevail in the intervening years. Yet in the meantime, we must be prepared to meet those requirements on time and in full."

• **Aluminum.** In addition to the heavy forging and extrusion press program, a second USAF-financed program calls for building two 144-in. rolling mills for producing tapered aluminum sheet required for high-speed aircraft skins. Additional aluminum fabricating capacity will be sought by the Air Force for high-strength alloy sheet, rod and bar, welded tubing, heavy castings and hard alloy extrusions.

• **Alloying metals.** Increasing supply of alloying metals such as nickel, tungsten, cobalt and molybdenum are likely to be offset by the rapidity with which military requirements for these metals in high-speed aircraft are increasing.

Gurney Reappointed For Six-Year Term

President Truman has reappointed Republican Chan Gurney as a member of Civil Aeronautics Board for six years to Dec. 31, 1958, subject to Senate confirmation.

CAB member Oswald Ryan was designated Chairman for 1953, but he has announced he will submit his resignation of the chairmanship to President Eisenhower Jan. 20.

Washington observers give Gurney the edge for Eisenhower designation as Chairman.

Other members of the Board are Josh Lee and Joseph Adams, both Democrats.

Stage Set for Defense Shakeup

Lovett says organization at top level is key weakness; supports proposed plan for stronger Defense Secretary.

By Katherine Johnsen

Secretary of Defense Robert Lovett has started the ball rolling on what promises to be a top controversial issue over the coming months: reorganization of the Defense Department.

In the department's semi-annual report, Lovett focused on the weakness of the Joint Chiefs of Staff, the Munitions Board and the Research and Development Board—agencies established in the Office of Secretary of Defense to pass on plans of the three services to accomplish a "unified" overall military program.

Lovett objects to the fact that memberships of the three agencies is made up of co-equal representatives of the three services who judge their own claims, a situation that lends itself to final log-rolling.

► **Final Decisions**—"This fault," Lovett observed, "would cause their unsatisfactory operation during a period of serious shortages in manpower, materials, or money."

The Munitions Board situation has been temporarily solved by the 1953 Fiscal Year Appropriation Act which gives the Secretary of Defense power of final decision on all procurement and production matters. Lovett has delegated to the civilian chairman on the board this authority over the three service representatives. The act expires July 1.

Lovett's remarks support the current proposal to separate JCS, the R&D Board, and Munitions Board from direct service participation. Under this proposal, members of the three agencies would be senior officers separated from any service command and responsible only to the Secretary of Defense. It would mean stronger control of the Defense Department by the Secretary.

► **Objections**—The general objection to the plan: The services might be half-hearted in executing decisions imposed arbitrarily from the top. The Chiefs of Staff, for example, would be responsible for carrying out programs which they had no direct hand in deciding.

Here are highlights of the reports by the services on the state of military preparedness:

• **Air Force report,** by Secretary Thomas Finletter:

"The strategic air arm must be kept strong, for it constitutes the major deterrent to aggression. . . . It is global in scope. . . . It relies to a great extent on overseas bases throughout the world to bring all probable targets within the range of its aircraft. . . .

"A majority of the tactical command's wings are equipped with jet-propelled aircraft, although some still fly World War II piston-engined F-51s and B-26s. As the modernization program proceeds, these aircraft will be supplanted by newer all-weather jet types. . . .

"The development and testing of guided missiles made great strides during the year. . . . The various types of guided missiles were integrated into the several weapons systems. When operational they will be used in air defense, strategic and tactical air missions."

• **Navy report,** by Secretary Dan Kimball:

"The Navy recognizes that we are today witnessing merely the dawn of the atomic era. . . . As future weapons are developed the Navy will adapt them to shipboard use—as it has the useful weapons of the past and present, including the gun, the airplane, and the atom bomb. A weapon on board ship is a weapon with worldwide mobility. . . .

"Based on current world conditions, a minimum of 12 Forrestal carriers are required if the Navy is to carry out its primary mission. Experience has proven that in order to provide these ships to the fleet in an orderly fashion and because of the particularly long lead-time required, increased construction should commence immediately. . . .

"Experience to date has shown that neither the jet nor the propeller-driven aircraft has a monopoly of advantages, and each has certain disadvantages. As far as can be determined, both types will continue to be needed for an indefinite time in the future, each for its own particular and pronounced advantages. . . ."

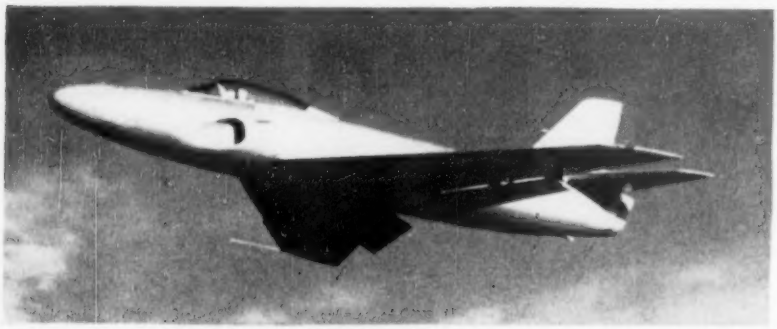
• **Army report,** by Secretary Frank Pace:

"The Army is devoting top priority to all aspects of atomic warfare . . . pushing ahead vigorously with the development of its own methods of delivery of atomic firepower. . . . In the surface-to-surface field, the Army is developing a family of missiles which are designed to carry high explosive or atomic warheads well beyond the ranges of existing artillery weapons, even under the most adverse weather conditions. . . .

"In the surface-to-air field, the Army's primary guided missile will provide, by an early date, a weapon capable of rapidly and accurately engaging and destroying the most modern, high-performance bombers at altitudes and ranges heretofore unknown. . . .

"A chain radar system which automatically tracks guided missiles throughout their complete flight . . . has been put into operation. . . .

"Significant progress has been made in the development of gas generating equipment for field production of guided missile propellants."



NEW SWEDISH JET TESTED

First flight view of the new two-seat Saab-32 Lance all-weather ground attack plane (Aviation Week Nov. 24, p. 19), shown taking off with its large Fowler-type flaps extended. The 700-mph. craft is powered by a Rolls-Royce Avon axial-flow engine and has swept wings and tail. Flush jet intakes are used. Wings and tail of the new craft have noticeably thin airfoil sections.

Australia Shelves Twin-Jet Delta

(McGraw-Hill World News)

Melbourne—Lack of finances has forced Commonwealth Aircraft Corp., Melbourne, to shelve plans for a high-performance twin-jet delta-wing plane which had advanced to the windtunnel test stage.

Observers here express the hope that the design will be picked up by North American Aviation, Los Angeles, Calif., with whom CAC has worked closely for a number of years.

Although few details of the craft are available, it was designed for Rolls-Royce Avon axial-flow turbojets.

Cessna Jet

- **New AF trainer marks entry in turbojet field.**
- **Twin-engine transport and Model 180 unveiled.**

By Alexander McSurely

One of the fastest moving small aircraft companies in the business—Cessna Aircraft Co. at Wichita—last week unveiled three new airplane models.

Two of these are new adventures for Cessna:

- A 400-mph, twin-jet military trainer.
- A highly streamlined, low-wing, tricycle-gear, five-place business plane designed to compete with the Beech Twin-Bonanza and Aero Commander.

The third is a new higher-powered, higher-performance redesign of Cessna's 170 high-wing four placer—aimed at the $10,000-$15,000 executive plane market.

▶**Sales Up**—Meanwhile Cessna President Dwane Wallace announced in his annual report to stockholders that Cessna sales for 1952 increased 55% over 1951, totaling $41 million (including $30 million military aircraft sales). It was the largest volume of sales since 1943. Earnings after taxes added up to $1,162,000 or $1.59 a share. Income taxes paid amounted to $3.85 per share and dividends were 50 cents a share. Military backlog of Cessna now stands at $75 million.

Most promising of the new models from the company's future standpoint is the twin-jet Model 318 military trainer, with which Cessna won the USAF's hotly contested Trainer-X competition.

Most immediately profitable is the new Cessna Model 180 executive plane guaranteed to cruise at 150 mph. The four-place aircraft sells at $12,950. Deliveries start with a mass flyaway Feb. 28 at Wichita.

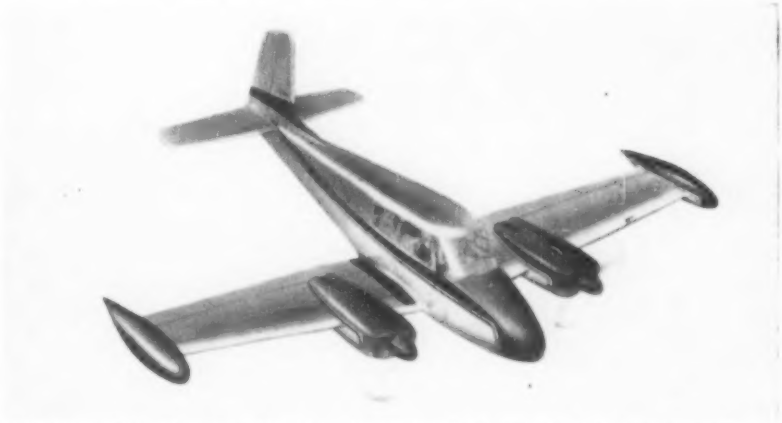
A year off in the sales picture but a promising contender in the growing twin-engine executive-plane market is Cessna's Model 310, scheduled for its first flight last week.

▶**Jet Trainer**—Winner over 14 other designs submitted by seven manufacturers, the Cessna jet trainer will be powered by two centrifugal-flow Marbore 352 engines of 900 lb. thrust each. They are French Turbomeca design and built in the U. S. by Continental Motors Corp. AVIATION WEEK (Industry Observer, Aug. 4) predicted that the Marbore was the most likely prospect for the XT powerplant.

Cessna has a Phase I contract for preliminary engineering and construction of a mockup, with a second contract in the Pentagon works for jet trainers for test and training evaluation.

The 318 design is to be a low-wing, two-place, side-by-side, all-metal craft with jet engines faired into the wing roots and with fully retractable tricycle landing gear.

MODEL 318 two-place twin-jet trainer won USAF competition over 14 other entries.



MODEL 310 five-place executive plane is entering flight test phase of development.

MODEL 180 four-seater is in production at Wichita and deliveries begin Feb. 28.

▶**Trainer Data**—Dimensions of the trainer are: span, 33 ft.; length, 27 ft. 1 in.; height, 9 ft. 10 in. Design gross weight is approximately 5,600 lb. A top speed of more than 350 knots (403 mph.) is projected.

The 318 is the first small all-jet plane built in America, giving Cessna a lead

in small-jet experience to add to turboprop knowledge the firm already is piling up with its XL-19B liaison plane. Most powerplant experts expect turbines to replace piston engines all the way down the line in aircraft because of the lighter weight per hp. or thrust pound. Smallplane jet and turboprop experience will give Cessna an important advantage over competitors in the predicted developments.

▶**Production Prospect**—More important for the immediate Cessna picture is a prospect that the 318 should be the next mass-production trainer for the military services, with possible output in the thousands of units.

With other companies speculating over the possibility of four-place jet runabouts for executive civilian use, a civilian twin-jet Cessna four-to-five-seat plane designed around the trainer "chassis" may not be too far in the future.

▶**New 180 Model**—Cessna's best-selling four-place Model 170's lineage plainly is visible in the new 180. But a larger powerplant and other improvements make the 180 a new airplane. It is an all-metal aircraft with a top speed of more than 165 mph. and equipped with the proven Cessna spring steel landing gear. Model 180 is powered with a new Continental 470-A six-cylinder engine rated at 225 hp. at 2,600 rpm. The engine plus a constant-speed Hartzell propeller and some cleanup of the basic plane design gives the 180 a cruising speed guaranteed "over 150 mph.," as compared to "over 120 mph." for the 170.

Comparison shows the two airplanes apparently have the same wing in span, area and airfoil—presumably beefed up a little for the 180. The new model's fuselage is one ft. longer than the 170. Major difference in appearance is the new square tail on the 180, approximately a foot higher than the rounded traditional Cessna tail fin of the 170.

With a cruising range of more than 4½ hr. and a 60-gal. maximum fuel load, the 180 should be able to make 600-mile jumps across the country without any real strain.

Other new 180 features:

- Fully movable horizontal tail.
- Cabin-controlled cowlflap.
- Electrically heated pitot tube and windshield defroster.

▶**New Twin**—Two Cessna twin-engine Model 310 prototypes virtually are completed and will make flights around the country this year in preparation for introducing the aircraft for sales in early 1954.

Powered with two flat 470-A Continental engines rated at 225 hp. each, the Model 310 has a five-place cabin and carries all its fuel outside the basic airplane structure in two 50-gal. streamlined wingtip tanks. It is a low-wing, single-tail craft with tricycle landing gear. Main wheels retract outward into the wing undersurface, a design feature aimed at reducing frontal drag in the flat nacelles. Powerplants are fitted with jet augmentor exhaust tubes.

Performance details on the airplane have not been released, but Cessna president Wallace says the 310 will outperform in level speed and climbs any other twin-engine four-to-five place aircraft now on the market. Wallace's claim would put the 310's top speed at more than 200 mph., with a cruising speed of slightly less than 200, and a climb rate of more than 2,000 ft./min.

▶**Military Production**—Largest current item of Cessna military production is Boeing B-47 Stratojet bomber empennage assemblies for Boeing-Wichita, the annual report said. Other major military business is in empennages for Lockheed's T-33 and F-94C and Republic F-84F jets and in prime production of Cessna's L-19A liaison Bird Dog planes, now in service in Korea.

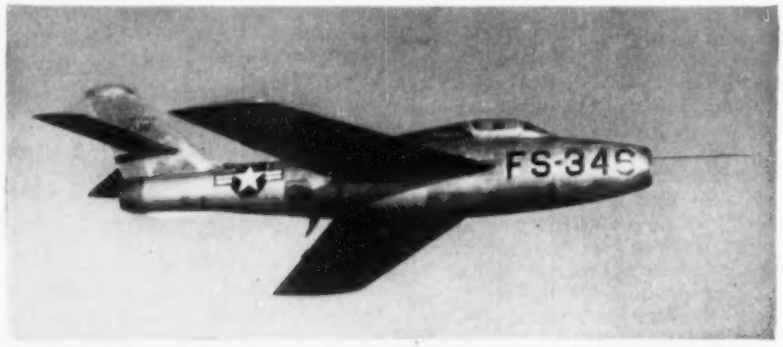
Cessna's new Helicopter Division, which last year took over Seibel Helicopter Co., is developing a larger helicopter designated Model CH-1. The new copter utilizes some Seibel principles and other helicopter developments but still is in early stages of preliminary development, Wallace indicated.

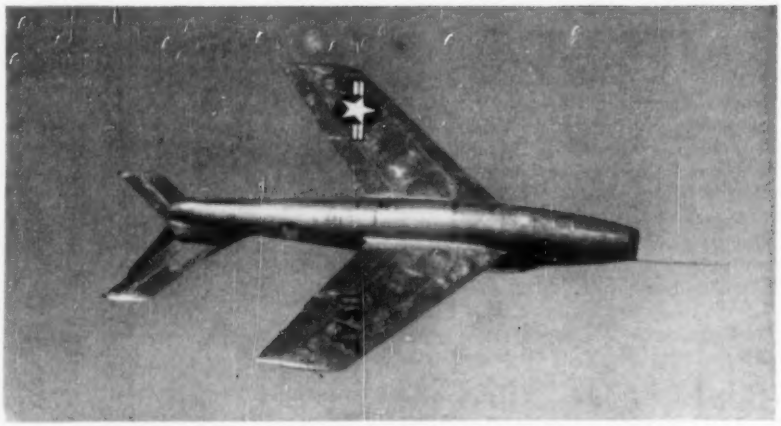
Davis Out as Deputy CAA Safety Director

William B. Davis, 45, who has been deputy director of the CAA Office of Aviation Safety, last week was transferred to a post of equivalent Civil Service status as deputy regional CAA administrator at Kansas City. The transfer took Davis out of one of the two hottest seats in Washington's CAA organization.

Both Davis and his former superior, Ernest Hensley, OAS director, have been under a crossfire of criticism, much of it coming from within CAA ranks ever since they "administered" a reorganization of the office last spring on the basis of a written and oral test.

▶**Hensley's Status**—A top CAA spokes-





THUNDERSTREAK SHOWS ITS FLYING FORM

New Republic F-84F Thunderstreak in normal level flight (top view) and on its back (above) displays sharply swept wings and tail. Wings are swept 40 deg. In top photo the pilot has extended the plane's fuselage dive brakes, visible just behind and below the wings. Preparations to mass-produce the F-84F, which will replace the straightwing F-84G, are underway at Farmingdale, N. Y., plant of Republic Aviation Corp., and by General Motors at Kansas City. The F-84F is powered by a Wright J65 Sapphire turbojet. Detailed production story on the plane appeared in Aviation Week (Dec. 15, p. 31).

man told AVIATION WEEK that no immediate appointment would be made to fill the deputy vacancy in OAS, and that no immediate change in Hensley's status is planned.

Davis, a former Navy pilot, joined CAA in 1938 as an inspector in Kansas City, returned to Navy service in World War II, rejoined CAA after the war. He was assigned to the New York CAA office shortly after the war. Later, in 1950, he was hand-picked as one of six CAA employes to take an eight-month executive training course, after which he was promoted to the OAS job.

Davis is a graduate of Tufts College and attended Harvard School of Business Administration. At Kansas City he fills a vacancy left by transfer of Samuel A. Kemp, recently named assistant administrator for administration, in the Washington office. Leonard Jurden continues as regional administrator at Kansas City.

Aviation Safety

USAF Crashes

- **Congress given data on military accidents.**
- **High officials stress safety gains achieved.**

A congressional inquiry last week brought out for the first time USAF flight safety data heretofore cloaked in "security classification" as top Air Force spokesmen answered probing questions of the House Armed Services Committee on the recent series of fatal USAF transport crashes.

▶**Galaxy Attends**—Air Force Secretary Thomas K. Finletter and his successor-designate Harold E. Talbott, and USAF Chief of Staff Hoyt S. Vandenberg headed a galaxy of one-, two-, three- and four-star generals participating in the all-out USAF presentation under television cameras and lights at the committee hearing room.

Although the Air Force flew 8 million hr. in 1952, a 75% increase over the flight hours of two years ago, the 1952 accident rate is the lowest in Air Force history, 29 major accidents per 100,000 hr., Gen. Vandenberg testified.

This indicates that the Air Force experienced 2,320 major plane accidents in 1952, in which either fatality or serious injury or serious damage to the airplane was involved.

Secretary Finletter traced the major accident rate for Army Air Service, Air Corps, and Air Force from its worst peak in 1923 of 506 accidents per 100,000 hr. down to the present. By 1925 the rate had dropped to 215 per 100,000 hr.

▶**Rate Drops**—Lowest rate before World War II was approximately 40 in 1940. In 1942 the rapid war expansion in training pushed the rate up to about 80. It dropped during the war to about 40.

Then the accident rate climbed to a postwar peak during demobilization in 1946 of 61, although flying hours then were about at the lowest postwar ebb, slightly over 3 million hr. Since then the rate has declined year by year although the number of flight hours has steadily climbed.

Maj. Gen. Victor Bertrandias, deputy USAF inspector general, and Brig. Gen. Richard J. O'Keefe, USAF director of flight safety research, outlined the USAF flying safety program launched in 1950 to which Secretary Finletter and Gen. Vandenberg attributed much of the recent safety gain.

▶**All-Weather Force**—Vandenberg told the committee that today the Air Force is attempting to operate on an all-weather basis all over the world from Alaska to Saudi Arabia.

"The entire Air Force operates today under conditions in which only the most advanced of our planes and pilots would have operated four years ago," Vandenberg said. "No other air force in the world can compare with it. This is the considered judgment of distinguished foreign leaders, not just my own opinion. Nevertheless the safety record is steadily improving."

'AIR RAID' AID

A Sikorsky S-55 hoists a litter containing a "casualty" from a "bombed" building at the federal Civil Defense Administration Warden and Rescue Training School, Olney, Md. Here an entire city street of engineered "ruins" has been built to give realistic training in civil defense.

▶**No Sabotage**—Bertrandias testified that no evidence of sabotage had been discovered in the recent series of C-119, C-54 and C-124 accidents, despite careful investigation. Checking did not show any real pattern of coinciding causes, except that most of the crashes occurred during periods of marignal or bad weather.

Rep. Leroy Johnson interrupted the general discussion of trend to higher speeds and jet airplanes to point out: "Most of the accidents we are thinking about are transport planes, conventional planes just carrying passengers or freight," and directed the inquiry away from the overall picture, to the specific accidents. "Should you take these weather risks when you are transporting a large number of people in conventional planes?" he asked.

• **McChord crash.** Gen. O'Keefe described the crash of an Air Force C-54G at McChord AFB, Washington, Nov. 28. After the pilot announced he was going to an alternate field, abandoning plans for a landing because of the low ceiling, the plane plunged into some 75-ft. trees beyond the end of the runway seconds later. Investigation indicated that the crash was caused by failure of No. 3 engine at low altitude. Asked why the pilot didn't land at Seattle, where ceiling and visibility conditions were 12,000 ft. and 3 mi., O'Keefe said that the pilot had elected to land at McChord, that the choice was his responsibility and that the field weather was over limits when he started letdown.

• **C-124 crash.** Gen. Bertrandias, reviewing the crash of a C-124 Dec. 20, at Larson AFB, Washington, testified that the flight engineer was responsible for unlocking the gust lock, which was behind the pilot. Procedure is to unlock it fully at takeoff point, he said. First movement of the lock releases the throttle and additional down movement is required to unlock the control surfaces.

Bertrandias said he had checked several C-124 gust locks and found varying degrees of control operation with the lock on.

"You could take off on that particular plane, with the lock on, but you could only rise about as far as that pilot did before you would nose down," he said.

He pointed out that a new procedure for fixing responsibility for disengaging the gust lock before flight had been ordered and that Research and Development Command has been directed to re-evaluate the control lock and redesign it for a more foolproof operation.

The inquiry will be continued Tuesday, Jan. 13 at 10 a.m. in the House Armed Services hearing room.—**A. McS.**

CAB Denies UAL's Low-Fare Service

Civil Aeronautics Board last week gave United Air Lines until next week to decide the future of UAL's aircoach.

CAB denied United's recent petition for permission to charge coach fares for what the Board considers first-class service. The Board order was the latest development in a controversy touched off last month when UAL president W. A. Patterson charged that high-density seating is unsafe and began selling only 54 seats on his 66-passenger DC-4 coaches.

Patterson answered almost immediately that ". . . United Air Lines plans to continue to operate its coach service with the limited seating capacity."

▶**Forced Into High-Density**—Patterson told a bankers convention in Florida:

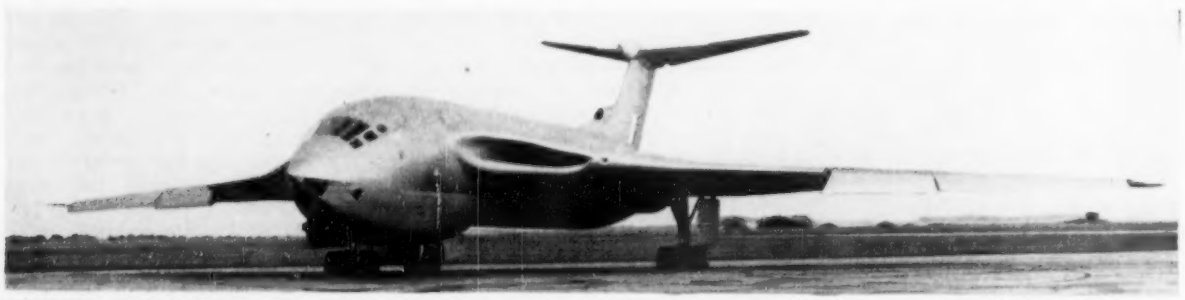
"We were forced into the coach business by threat. . . . We were reluctant and hesitant about going into the coach business. Why? Because we weren't satisfied we were doing the right thing."

Because CAB had approved low aircoach fares on the basis of a minimum 64-passenger DC-4 capacity, United was forced to petition the Board for a special exemption to offer only 54 seats on its DC-4s until the airline could modify the aircraft to seat 58 passengers—a capacity United considers safe. That is the petition which was denied by the Board.

"The lowered seating density involved in United's proposals," the Board ruled, "would undoubtedly raise the unit cost of . . . coach services, making such service less economic, thus cutting off numerous cities and passengers from . . . low cost transportation."

▶**Public Hearings Possible**—If Patterson continues his differences with CAB on the coach safety issue, the Board will be required to hold public hearings on United's coach tariffs.

Meanwhile, CAB has received an application from nonsked Air America for a temporary exemption to provide coach service on United's routes.



CRESCENT-WING Handley Page H.P. 80, with sweptwing Vickers Valiant and Avro Vulcan delta, comprises future RAF jet bombers.

British Set Sights on Subsonic Jet Bomber Force

By Nat McKitterick
(McGraw-Hill World News)

London—The Royal Air Force is aiming for operational flight by 1955 of three jet-powered long-range heavy bombers—the Vickers Valiant, the Avro Vulcan and the recently tested Handley Page H.P. 80.

The H.P. 80 made its first flight during the final days of last year, putting into the air a true crescent bomber wing that Handley Page says "combines the merits of the delta, swept and razor-thin wings without any of their disadvantages."

All three bombers will fly at operational speeds estimated at 600 mph. and altitudes about 50,000 ft.

British designers say the cruising speed of the heavy bombers will be "on the brink of the sonic barrier," forcing enemy fighters to cross and re-cross the thunderclap hazard in interception passes.

▶**Larger Engines Later**—The bombers eventually will be powered by jets of about 10,000 lb. thrust each, although engines of less power are installed in the prototypes. Avro's delta-wing Vulcan will be driven in operational flight by four Bristol Olympus jets, rated at nearly 10,000 lb. Vickers' modified crescent-wing Valiant, now powered by four Rolls-Royce Avons, is expected to have engines of the same type but more powerful than the present Avon rating of 7,500 lb. Four Armstrong-Siddeley Sapphires installed in the H.P. 80, expected to be known as the Victor, also will be pushed well past the current thrust of 8,300 lb.

The British press says the Vulcan's bomb load will be twice that of a World War II heavy bomber. The H.P. 80 should be in the same class, but the Valiant probably will not.

Wing span of the Vulcan is estimated at 100 ft., and the Valiant and the H.P. 80 at approximately 120 ft.

The three bombers largely will be hand-built and hand-machined, limiting the initial orders to somewhere between 25 and 50 of each type.

▶**H.P. Claims**—Striking wing plans of the three "V"s" are testimony to Britain's intense experimentation with aerodynamics of near-sonic flight. Each manufacturer makes broad claims for his own design, but Handley Page's claims for the crescent top them all.

R. S. Stafford, chief designer at Handley Page, says the H.P. 80's crescent wing (AVIATION WEEK Nov. 17, 1952, p. 22) will allow the Victor to "fly fastest, farthest and highest with greatest economy."

The crescent sweeps back at three angles set off in three sections of the wing. Thickness tapers outward from a heavy root section around the Victor's engine housings to an extremely thin tip.

"We could build a very thin straight wing," Stafford says, "but our bomber would look like a Christmas tree with engines and fuel tanks hanging from the wing and the undercarriage taking up useful space in the fuselage. Such a design would be impossibly heavy and out of the running as a long-range bomber. Figures show that practicable wing thickness at a high Mach number can be employed if combined with sweep."

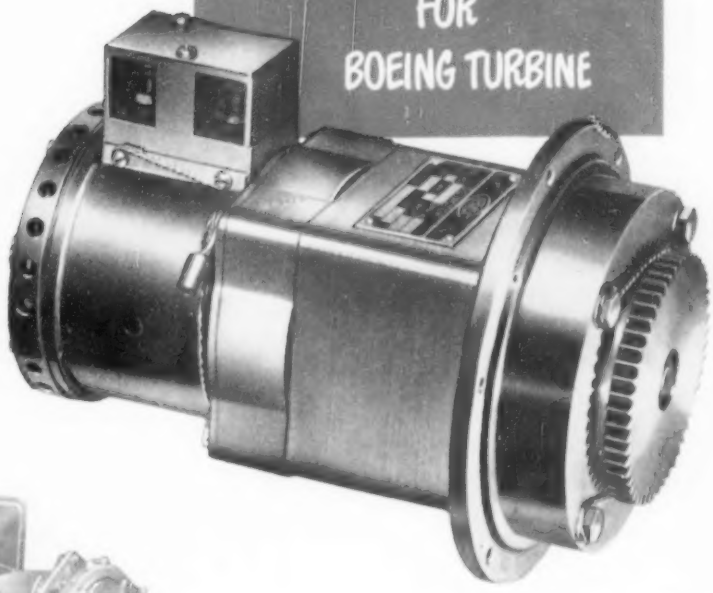
▶**Other Characteristics**—Stafford says the scimitar shape of the wing allows an unobstructed bomb-bay and enclosure of engines, fuel and undercarriage in a light, efficient structure with no weight penalty.

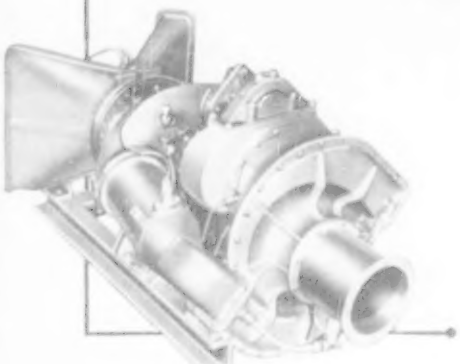
Other characteristics of the new Handley Page bomber:

- Leading-edge flaps as well as flaps on the trailing edge of the wing.
- High degree of cabin pressurization is indicated by the small size of windows in the H.P. 80.
- Control balancing system is speculated by observers because of a small opening in the leading edge of the Victor's sweptback tail fin.

EEMCo technical bulletin

LIGHTWEIGHT COMPACT STARTER-GENERATOR FOR BOEING TURBINE





The starter-generator used on the Boeing 502 Turbine is another example of EEMCO ability to design and produce motors to solve special problems.

This 15¾ pound unit brings the turbine up to 6000 RPM for firing and is able to support the starting effort after firing, up to 10,000 turbine RPM. When the turbine is operating, it acts as a generator without mechanical change-over or gear box and is capable of delivering 30 amps continuously.

Compactness and light weight result from the direct mating of the starter-generator with engine gear train, making it an integral part of the turbine.

High temperatures are involved since the installation is in close proximity with the combustion chamber.

This EEMCO starter-generator is ideal for use on all types of small turbines wherever a combination of starting and generating is required.

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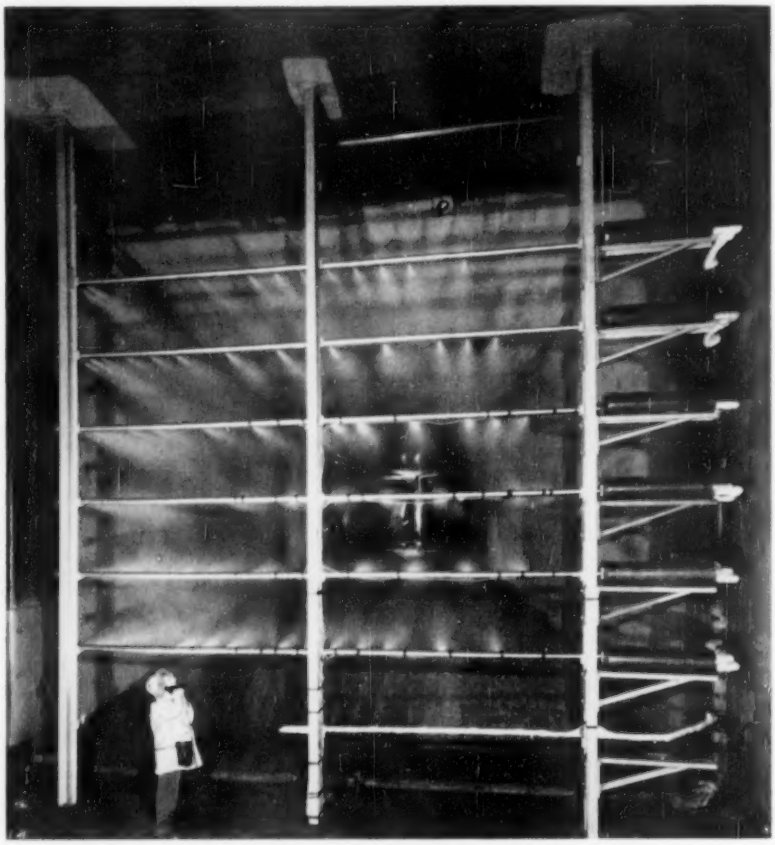
3-515

NACA Learning How to Break the Ice

- **New research attacks freezing on airfoils.**
- **Heated gas applied in cycles seems answer.**



WINDTUNNEL'S "clouds" are created by 70 special air-atomizing nozzles.

Airplane icing is—like airplane drag—generally accepted as part of the price paid for flight.

Like airplane drag, icing's effect is slight at first, but builds up rapidly to catastrophic proportions if nothing is done.

And like the pursuit of drag reduction, attacks on the icing problem account for a lot of the research time spent by manufacturers of aircraft, engines and equipment, as well as by research agencies such as the National Advisory Committee for Aeronautics.

Representative of its effort in the field is some recent work done on cyclic de-icing by NACA scientists V. H. Gray, D. T. Bowden and U. von Glahn.

▶ **Definitions**—There are two basic ways of removing ice from an airplane: Mechanically, such as by the inflating rubber "second skin," and by application of heat.

Heating methods break down into the two categories: continuous and cyclic. NACA's work has been with both these types, but its latest recommendations have been based on the study of cyclic de-icing.

In cyclic removal of ice, intense heat is used for short periods. Between applications of heat, a thin film of ice forms. The heat melts the ice immediately next to the surface and produces a thin layer of water at the interface of ice and skin. The air stream then blows the ice away.

If the time required to remove the ice is short compared with the time during which the ice is allowed to form, then heat can be directed to segments of the surface in succession. This means that the total heat load will be smaller than if the whole airfoil were heated continuously.

But there appears to be need for a continuously heated parting strip near the leading edge of the airfoil being de-iced. This divides the ice formation into two strips and makes removal easier.

▶ **Why Cyclic?**—Some earlier design analyses showed that continuous heating for de-icing resulted in a performance penalty in the case of highspeed, high-altitude transports. Heat requirements for the task were extremely large and, in some cases, prohibitive.

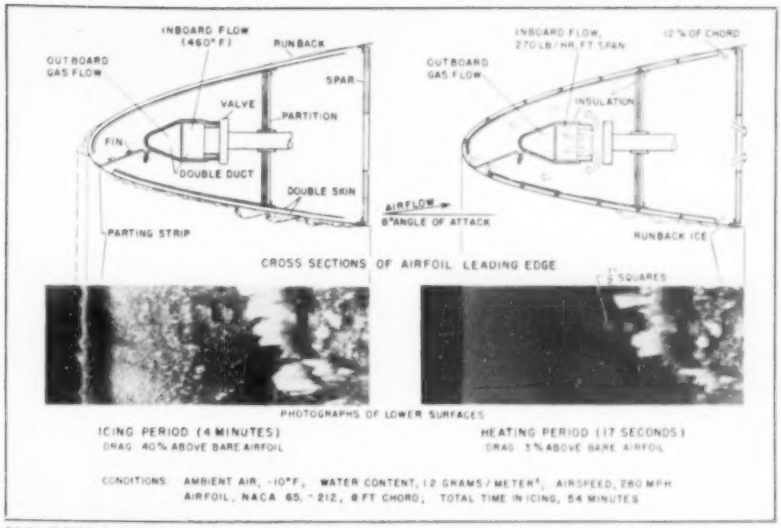
Previous studies of cyclic de-icing had been made on the basis of electrical systems. But the NACA report says that the electrical system has inherent disadvantages in weight, susceptibility to failure by damage to the heating circuits, high maintenance cost, and fire hazard in the event of system failure.

▶ **Why Hot Gas?**—A design study provided the final argument against electrical heating by showing that the most economical system with respect to installed weight would be one using hot gas from some source, such as a turbojet compressor.

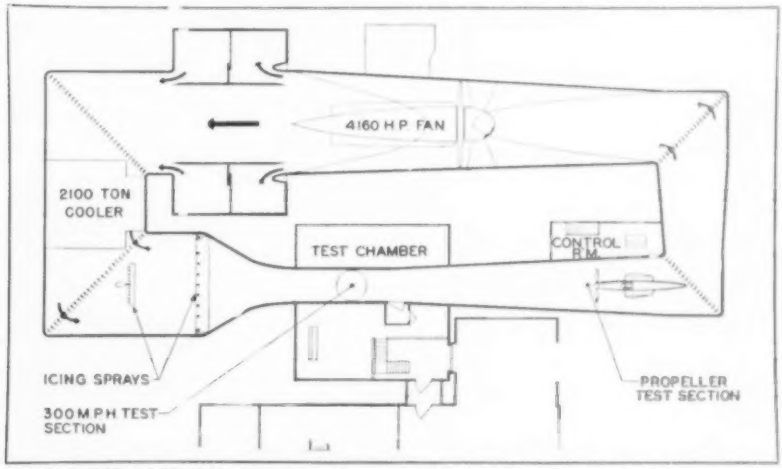
Reduction in heating requirements because of the cyclic system rather than the continuous-heating system would pay a dividend in reduced performance penalties. And further, a hot-gas system can be designed integral with the aircraft structure.

▶ **Design Needs**—A careful analysis of design requirements by the NACA scientists spotted these basic considerations:

- **Maintain a constant heat load.** This is done in the test model by dividing the area to be heated into a number of segments. The total number of segments heated in sequence will equal the cycle ratio, that is, the total time divided by the heat-on period.
- **Maintain temperature in the gas supply duct.** This avoids too much thermal lag in the system.
- **Maintain continuous heating at a parting strip.** This strip, located near the stagnation region of the airfoil, serves to keep the ice segments broken there and to provide rapid and consistent ice removal during cycling.
- **Chordwise parting strips may be desirable** to prevent ice-bridging between



ICE BUILD-UP and removal during **NACA** tests on airfoil are illustrated here.



PLAN VIEW of **NACA's** icing research set-up at Lewis Flight Propulsion lab.

adjacent segments and to insure good ice removal.

• **Insulate the gas supply system** to reduce heat losses if study shows this to be necessary.

▶ **Current Research**—NACA's Lewis Flight Propulsion Laboratory is now conducting a program of evaluation of the cyclic hot-gas de-icing system. NACA hopes to find the basic parameters for successful operation and the relation between heating requirements, meteorological conditions and aircraft operating conditions.

Tests were made on a low-drag airfoil with an eight-foot chord in the Lewis lab icing research tunnel.

The model used a parting strip, near the stagnation region, which was continuously heated by hot gas; the remainder of the leading edge was cyclically heated by hot gas. General construction of the leading edge was double-skinned.

Tests were made between two and eight degrees angle of attack at airspeeds of 180 and 280 mph. Air temperatures were —11F to 20F, and gas inlet temperature was 200F to 510F.

The operational icing condition was selected so that the combination of liquid-water content and air temperature gave an extremely severe icing condition. The test airspeed was the maximum attainable in the tunnel at all the angles of attack to be used.

A five-degree angle of attack was chosen for the operational condition because it represented a typical value for a turbojet aircraft at low cruise attitude. That angle also gave a fairly large area of impingement for the droplets of water in the atmosphere.

Gas temperature was felt to be representative of that attained at turbojet compressor outlets.

▶ **Findings**—First results of the NACA tests have shown satisfactory de-icing of the test airfoil over a range of cycle ratios from 10 to 26. (Cycle ratio is the total cycle time divided by the time during which heat is on; thus the higher cycle ratio goes with the shorter time of heating.)

Air temperature and cycle ratio were the prime variables for the tests; heat-off period, liquid-water content, airspeed and angle of attack had only secondary effects on heat requirements.

Best results came from a heat-on period of about 15 seconds with a heat-off period of about 260 seconds. This gave minimum runback of melted ice, efficient ice removal and minimum total heat input.

Representative data associated with good cyclic de-icing for the specific operating and icing condition were:

• **Airspeed, 280 mph.**
• **Datum air temperature,** zero degrees F.
• **Liquid-water content,** 0.6 grams per cubic meter.
• **Angle of attack, 5 deg.**
• **Heat-on period, 15 sec.**
• **Heat-off period, 260 sec.**
• **Gas temperature** at plenum chamber inlet, 467F.
• **Gas flow, 800 lb./hr.**
• **Spanwise temperature drop** in supply duct caused by parting strip, 7F/ft. span.
• **Cycle ratio, 18.3.**
• **Equivalent continuous heat** requirement for cycled areas, 1,615 Btu./hr.

Generally the shortest heating periods and best ice removal resulted from the highest gas temperatures and flow rates usable for a given operating and icing condition.

Fuel Systems Get Lab 'Flight' Check

Entire fuel systems are being put through operational phases in a new laboratory recently completed at Northrop Aircraft, Inc., Hawthorne,, Calif. In addition to functional testing of existing system designs, the lab will help develop new configurations of fuel installations.

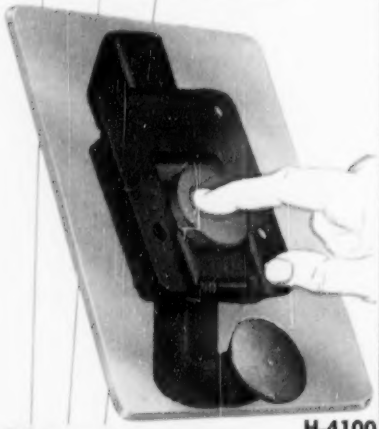
▶ **Capabilities**—The new facility reproduces atmospheric conditions for altitudes up to 80,000 ft. within temperatures ranging from —85 to 170F.

Several full-scale system mockups are accommodated, including that for the F-89D Scorpion. This latter consists of a complete right-hand wing and fuselage system to show performance of pumps, sequencing devices, maximum transfer rates through tanks, pressures and pressure losses in tanks and lines, evaporation and slugging losses, and operation under emergency conditions.

Ability of the fuel system to deliver at the required rate under extreme altitude, temperature and angle of attack can also be determined.

▶ **Controls**—The lab has a large control board and three auxiliary panels which automatically record data on environ-

"Operation Push Button"



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mental conditions supplied to the test chambers and on operation of the fuel system as it is subjected to a wide range of flight conditions.

A tilting control device permits shifting of the entire fuel system mockup to correspond to the motion of an airplane in flight.

Various individual fuel system components can be checked in separate testing rooms. Thus, one of these areas contains a vibrator and slosher for rolling and pitching simulation.

► **Temperature Schemes**—Jet fuel is stored underground. Hot water heats the fuel before it enters the fuel system, while alcohol and CO_2 are combined to give sub-zero temperatures. Hot and cold boxes—50 ft. long and 14 ft. square—are used for external control of temperature.

Northrop reports that provisions have been made to run fuel lines directly to production models of aircraft to effect in-plane testing of fuel systems on the ground.

Ray Borman, Northrop test facilities engineer, supervised design and installation of the equipment and heads the laboratory.

Navy Super Connie Passes Strength Test

The Navy's new R7V-1 Super Connie recently passed final strength tests which encompassed nine weeks of trials.

A special counterweighted steel framework was erected about the entire plane, together with a 150-jack system embodying units from 1,500-lb. capacity to a size capable of lifting a five-room frame house.

Lead ingots in the fuselage plus additional external forces permitted a total downbending force of 175,000 lb. Fuselage tests also included pressurization trials to simulate high altitude conditions.

Meanwhile, another R7V-1 has been undergoing extensive checks on flight characteristics at Lockheed's engineering flight test division.

The R7V-1, powered with Wright Turbo-Compound engines, is pegged to cruise over long ranges at 340 mph., with top speed approaching 400 mph. In addition to military orders, 12 airlines have ordered the plane, which first flew last November.

BELTED BOGIE LANDING GEAR

New bogie landing gear fitted with rubber belts is said to enable aircraft to utilize rough landing fields safely. The inventor, Count Giovanni Bonmartini, developer of an earlier four-wheel bogie landing gear, claims the belt arrangement doubles the gear's support surface, thereby reducing unit load. Experimental model shown here is installed on an Auster Mk. 5. Design was developed for the Establishment of Scientific Technology, Italy, where Bonmartini is head of the aeronautics department.

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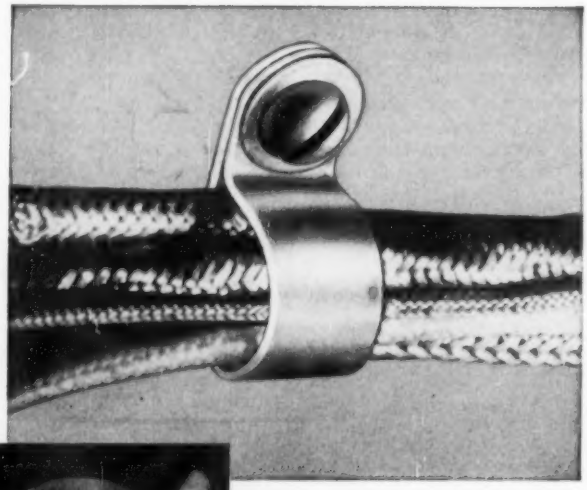

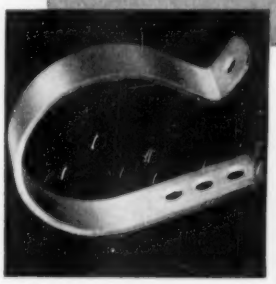

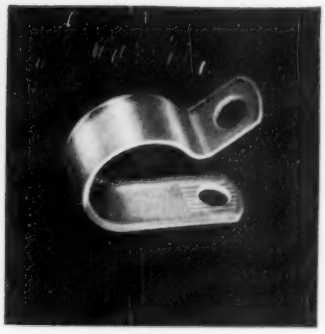

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Ramjets or Rockets for Missiles?

- **Marquardt favors his 'flying stovepipes.'**
- **Says they offer longer range than rockets.**

By Scott H. Reiniger

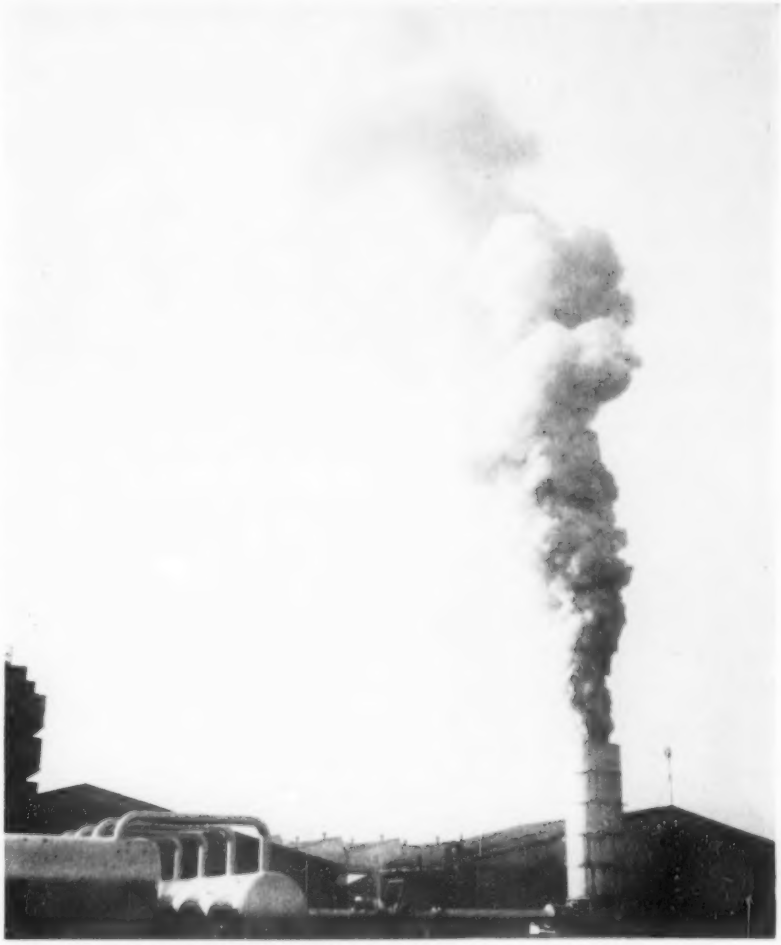
A possible measure of this nation's status with regard to development of long-range missiles is the scale of activities at Marquardt Aircraft Co., Van Nuys, Calif.

Marquardt, a pioneer since 1944 in ramjet engines, has staked its future on this type of powerplant and is devoted exclusively to its development and production. Roy M. Marquardt, company president, says that the ramjet is the engine that will power any supersonic missile with ocean-spanning range in the foreseeable future.

Many engineers say the rocket is as likely a powerplant as the ramjet for this purpose. It promises a much higher order of speed, and difficulties in the way of producing a practical long-range rocket are no greater than those confronting the supersonic ramjet, they claim.

Marquardt, however, sees the rocket's use confined to shorter flights. Most engineers seem to share his views. Rockets may take us to the moon someday, Marquardt says, but their range now is just a few hundred miles.

► **Dragging Feet?**—Speaking to Marquardt, one gets the feeling that many in the industry think this country can do better than it has in the race with Russia to develop intercontinental missiles. While a big climb in production of some missile types is in the offing, no sharp increase in development and production activities centering around the intercontinental missile's powerplant is imminent, Marquardt told AVIATION WEEK. The supersonic ramjet engine can be considered a long-term development, he stated.

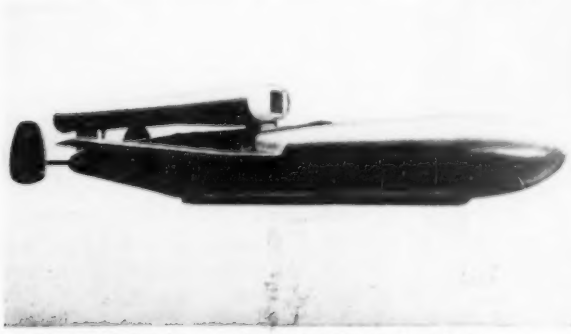


MARQUARDT lab at Van Nuys, Calif., where jet engine parts are tested.

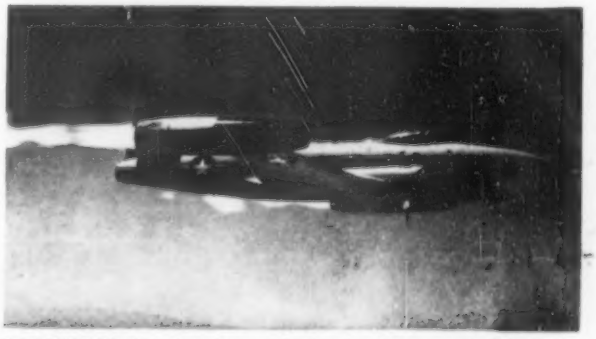
A look at the company's annual report for 1951 gives a clue to U. S. interest in ramjets. The company was organized in 1944, when Marquardt became president, in addition to his duties as director of aeronautical research at the University of Southern California, then engaged in ramjet research for the Navy.

Sales have risen gradually in the past eight years, picking up some momentum in the last two. They were $3.9 million in 1951, a 55% increase over the year before. Sales last year were expected to reach about $6 million. More than half of this income has been for research and development.

Production is on the upgrade. Employment jumped from 520 to 850 in the last year. But none of the production is for supersonic ramjets, as



GLOBE XKD5G drone is driven by Marquardt pulsejet.



LOCKHEED Shooting Star made first ramjet-powered flight.

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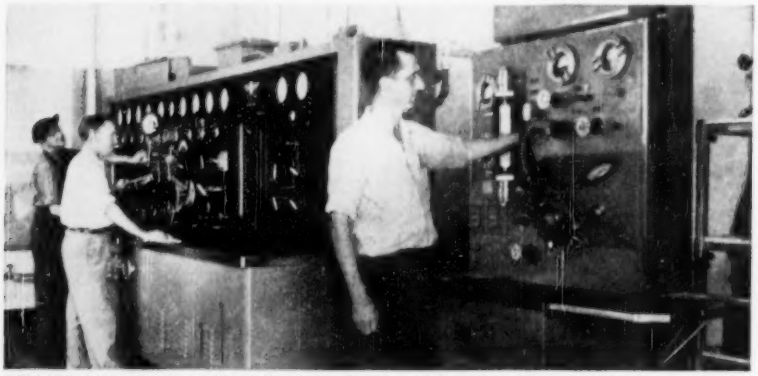

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far as can be determined. The main emphasis appears to be on pulsejets and ramjets for subsonic missiles and target aircraft, and afterburners for turbojet engines.

▶ **Ramjets' Appeal**—Ramjets can be produced "at a fraction of a dollar per horsepower," Marquardt claims. They combine range, power, light weight and low cost—meeting the needs of an expendable aircraft.

However, supersonic ramjets will not be the simple "stovepipes" of their subsonic counterparts. They will carry more accessories, among other complications. Some phases of engine development, such as burners, "are in good shape," Marquardt disclosed. But these are offset by such obstacles as how to observe under actual flight conditions a ramjet at supersonic speeds when there are no test beds that fast.

This has been partially solved on the ground by construction of a $2.5-million ramjet testing laboratory, with Air Force funds. Marquardt says it is the best ramjet test facility in the world. This installation can squirt 2,000-mph. blasts of air for studying operation of complete engines under full power at simulated high altitudes. The nozzle is big enough to crawl into.

▶ **Ducted Rocket**—In push-button warfare, the ramjet missile should be able to take off from a standing start on the ground. Since it cannot operate at low speeds, an auxiliary means of locomotion is indicated to get it underway.

Various ramjet-rocket combinations are being studied. One is the ducted rocket. This is a small rocket suspended within the ramjet to produce the static thrust needed to get the missile off the ground and to serve as an igniter of the ramjet fuel when operating speeds are attained. The rocket, located within the engine duct, also produces a low pressure area, sucking in air faster to raise efficiency of the ramjet.

It may be production of supersonic ramjets will be brought about by the demand for practice target planes which will need them to keep up with piloted, supersonic fighter craft, and that application in long-range missiles will follow after everything else has become supersonic.

Queried by AVIATION WEEK, Marquardt would give no indication whether or not a ramjet missile has flown at supersonic speeds. He says only that "all announced" production models are subsonic.

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Fleet Manufacturing, Ltd., Ft. Erie, Ont., has reached a working agreement with Canadair, Ltd., Montreal, under which Fleet will become a "major subcontractor" of Canadair.

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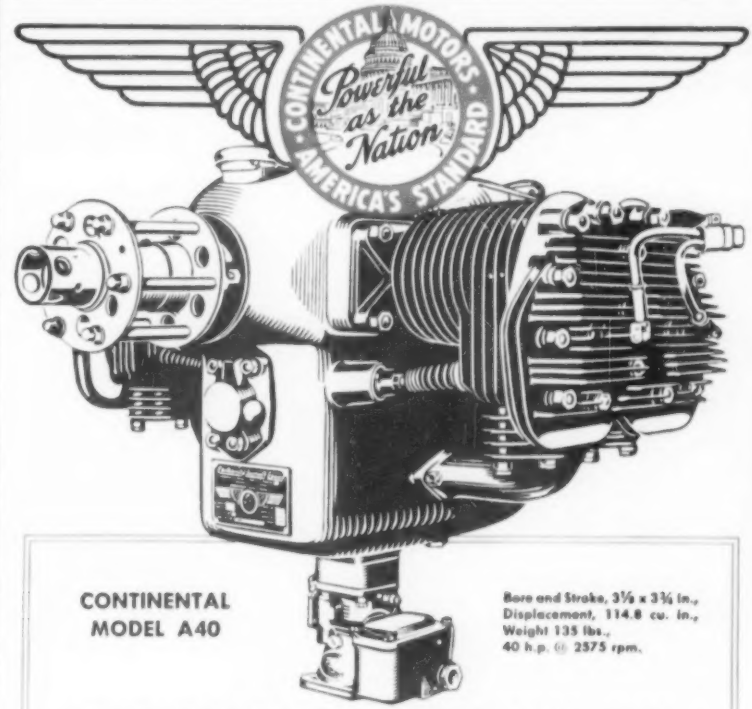
▶ **Navy Asked**—Alderson developed the dummy to meet requirements of the Navy for a synthetic human being. The dummy had to be vertebrate, with skeletal structure and resilient skin. Usual characteristics of weight and weight distribution had to be met.

His proportions are those of the average of Naval aviation cadets trained during the second World War. Overall height is 5 ft. 9 in., and weight is 154 lb.

Flesh of the dummy—composed of sections of foam and sheet rubber—is attached directly to the skeleton. Bundles of elastic cords, which simulate the stiffness of muscles, are anchored to metal bones.

Most of the major joints of the body are reproduced, except for finer articulations in hands, feet and the



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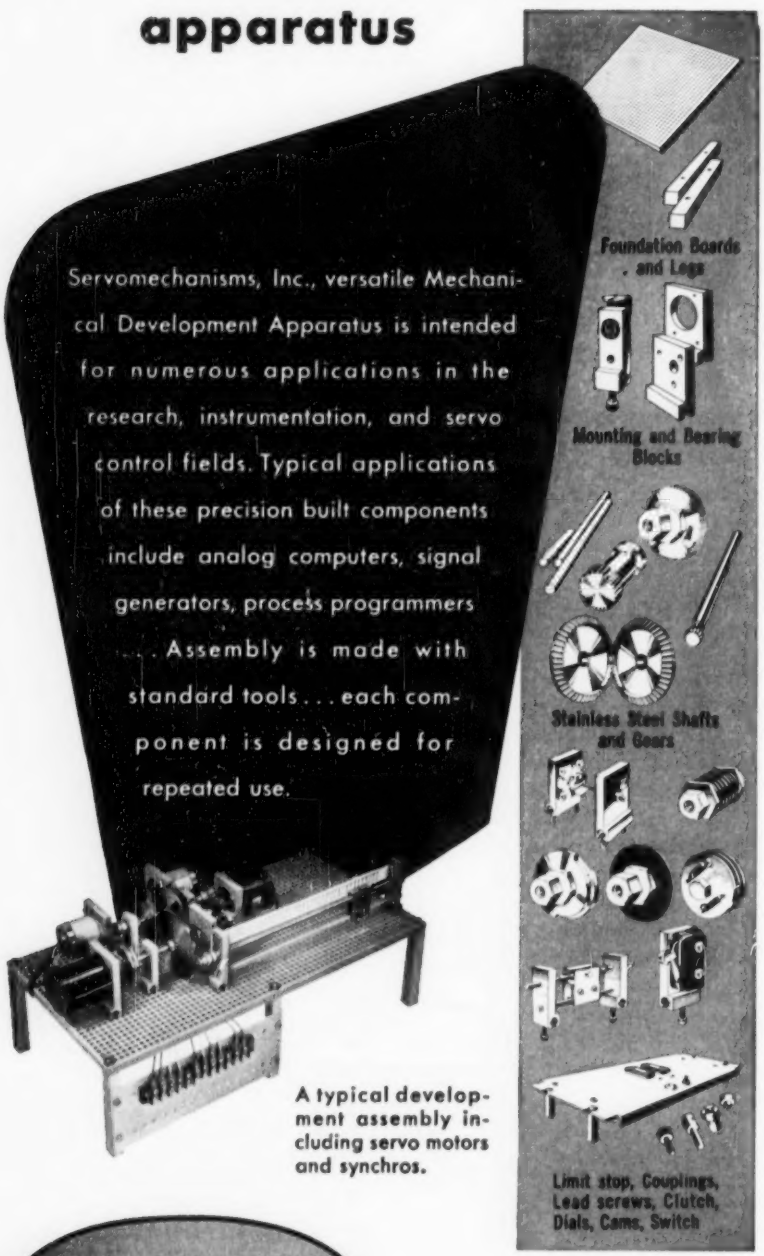
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Pre-positioning is possible, too. Mark II will sit without external support in a chair or on the floor with legs extended or drawn up. Some positions standing are also possible, and with careful balancing, extreme variations in stance can be obtained.

Rocket Society Summaries Concluded

Rocket propellants and powerplants were among the subjects discussed in papers presented at the American Rocket Society's recent seventh annual convention held in New York.

The following five summaries conclude AVIATION WEEK's coverage of the meeting. Previous summaries were printed Dec. 22, 1952, p. 31, and Jan. 5, p. 41.

► **The Evaluation of Competing Rocket Powerplant Components for Two-Stage Long-Range Vehicles, A. L. Feldman, Thermodynamic Engineer, Consolidated Vultee Aircraft Corp.**

Minimum net cost is proposed as the means for establishing the relative desirability of competing rocket powerplant components. It applies to missiles of the same class performing identical functions, for example, covering the same distance with the same payload. The relationships are derived from simple missile performance parameters.

Characteristics of a hypothetical two-stage long-range rocket vehicle are presented. Exchange rate curves are given for this vehicle to show the order of allowable compromise that can be made between weight and efficiency.

Several powerplant arrangements are analyzed for this missile and the proposed

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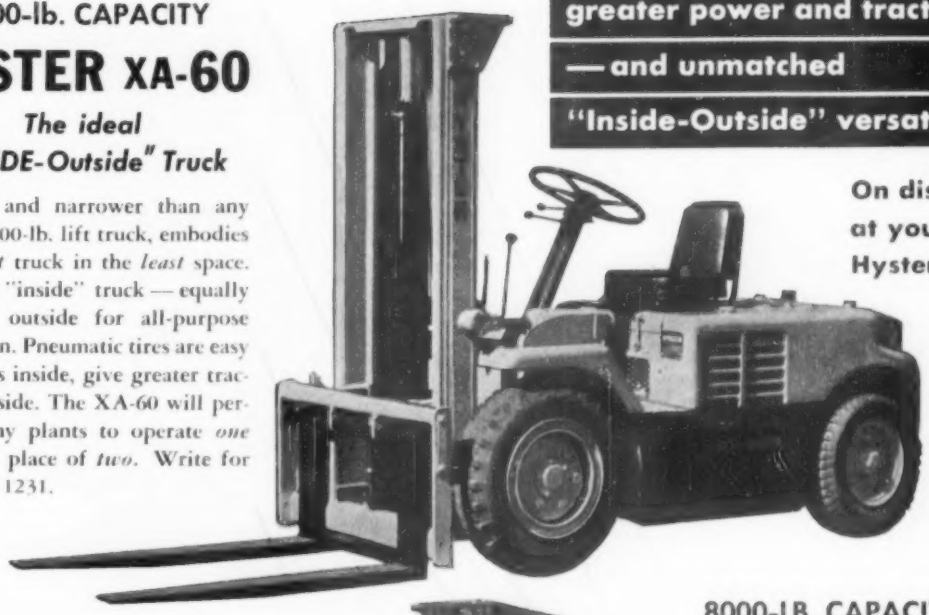

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technique for establishing desirability is demonstrated.

▶The Effect of Variation of Propellant Density on Rocket Performance, Jack Lorell and Albert Hibbs, Jet Propulsion Laboratory, California Institute of Technology.

This paper analyzes the effect of propellant density on rocket performance and presents the results graphically. These results bear out in some measure an earlier assertion that high density is desirable even to the extent of sacrificing total energy available in some instances.

Improved performance of a missile may be obtained by programming high density propellant during the early part of the trajectory and low density during the latter part.

▶Hydrogen Peroxide—Problems and Operating Procedures at the Air Force Flight Test Center, Edwards AFB, George W. Meckert, Jr., 2nd Lt. USAF, Chief, Rocket Propellant and Materials Test Unit, Rocket Branch.

This paper presents a survey of the methods used for analysis, handling and servicing of concentrated hydrogen peroxide as a rocket propellant. Impurities content and stability determination procedures are described in detail. Methods of handling and servicing, including material, equipment, and safety requirements, are discussed.

A description of the passivation of surfaces for use with hydrogen peroxide is presented. Included are recommendations for improvements which can be made to provide for continued and safe use of concentrated hydrogen peroxide.

▶The Ignition of Fuels with Nitric Acid, K. C. Halliday, Jr., Dept. of Chemistry and Metallurgy, Eclipse-Pioneer div., Bendix Aviation Corp.

A variant of combustion processes is the use of nitric acid-oxygen carriers, and the support of a flame in a medium established by this chemical. These carriers provide reasonably stable sources of the oxygen needed for combustion. They may also within themselves provide for ignition, as in the hypergolic systems, and are cheap, abundantly available and commercial chemicals.

The author deals with the establishment of physio-chemical control over the ignition and combustion processes in nitric acid propellant systems. The paper is a product of six years development work on such systems.

▶A Modified Sodium-Line Reversal Technique for the Measurement of Combustion Temperatures in Rocket Engines, M. F. Heidmann and R. J. Priem, National Advisory Committee for Aeronautics, Lewis Flight Propulsion Laboratory.

The authors report the application of a modified sodium-line reversal technique at several stations within an open-tube rocket combustor. Technique, apparatus and results are described and discussed.

The effect of oxidant-fuel ratio on axial temperature distribution was evaluated for a single two-on-one impingement type injector utilizing liquid oxygen and alcohol as propellants.

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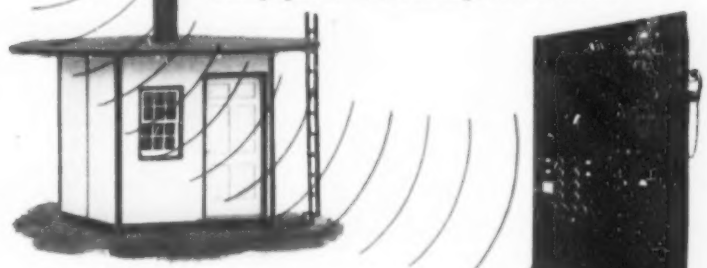

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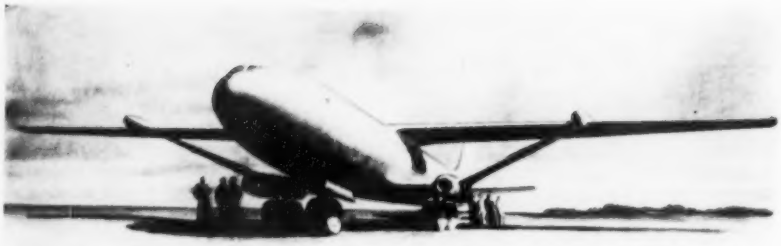

Details of H.D. 45 Jet Transport

There have been some changes made in the general layout of the new Hurel-Dubois H.D. 45 French jet transport. The extremely high aspect ratio—up to 30 on earlier proposals—which had trademarked the H-D line, has been reduced in this model to a more-conservative 185.

The H.D. 45 80-seat jet transport—Hurel's latest design—has been entered in the French government's medium-range transport competition.

Here is what Hurel proposes: The general geometry of the plane remains the same, with externally braced high-aspect-ratio wing. Engines are mounted on stub wings at the fuselage bottom; these surfaces and the brace strut contribute lift to the arrangement.

Landing gear is retractible, and the double tail has given way to the single fin and rudder.

Powerplants have not been announced yet, but they will be axial jets in the 9,000-lb. class, same as the Rolls-Royce R.A. 16, scheduled for the de Havilland Comet 3.

Span of the H.D. 45 is 147.6 ft., length 98.4 ft. and wing area 1,184 sq. ft. The plane grosses 90,405 lb., of which 28,665 lb. is fuel carried in wing-mounted nacelles like those of the Comet 3. Expected cruising speed is 452 mph. with a 17,640-lb. payload.

Photoelastic Coat Shows Stresses

A continuous strain gage, formed from a layer of photoelastic material cast on the surface of an airplane component, is being studied at the College of Aeronautics, Cranfield, England.

This technique, one ramification of the photoelastic method of stress analysis, was recently reported to the Royal Aeronautical Society by H. T. Jessop, Reader in Photoelasticity at University College, London.

Jessop's paper, "The Scope and Limitations of the Photoelastic Method of Stress Analysis," covers new developments in the field, developments which have taken place largely in research laboratories without the resources to make intensive investigations. These new schemes have been tried in enough cases, says the author, to demonstrate their value in a wide variety of stress problems.

▶ **Fundamental**—Photoelastic studies are made with models of the subject formed from a plastic material. These are most familiar in the two-dimensional form used for displays and museum exhibitions.

Polarized light is used to view the models under load, and the resultant pattern of colors in the model serves the purpose of locating and defining stresses.

Where there is two-dimensional stress distribution, such as in a riveted or bolted joint section, it follows that two-dimensional models are made. But it is possible to use the same kind of models for cases where the stress distribution of the object under study verges on the three-dimensional.

In an I-beam section, for example, with the loading in the mid-plane of the spar, parallel to the plane of the web, the web stresses will be sensibly two-dimensional and are deduced from the fringe pattern. Mean stresses through the thickness of the flange can be deduced from the pattern in the flange.

Fillets between flange and web would require the three-dimensional treatment, however.

Vickers-Armstrongs, Ltd., reports a recent series of tests made on such a spar showed high stresses which calculations had failed to bring out. The photoelastic tests took three weeks and gave better information than that obtained from calculations which had taken much longer.

▶ **In Three Dimensions**—When solids are studied by photoelastic means, the models generally have the stresses "frozen" into them by some method. Then thin slices are cut from the model and a series of two-dimensional studies made. Putting these all together gives the distribution for the solid.

This technique is used in the study

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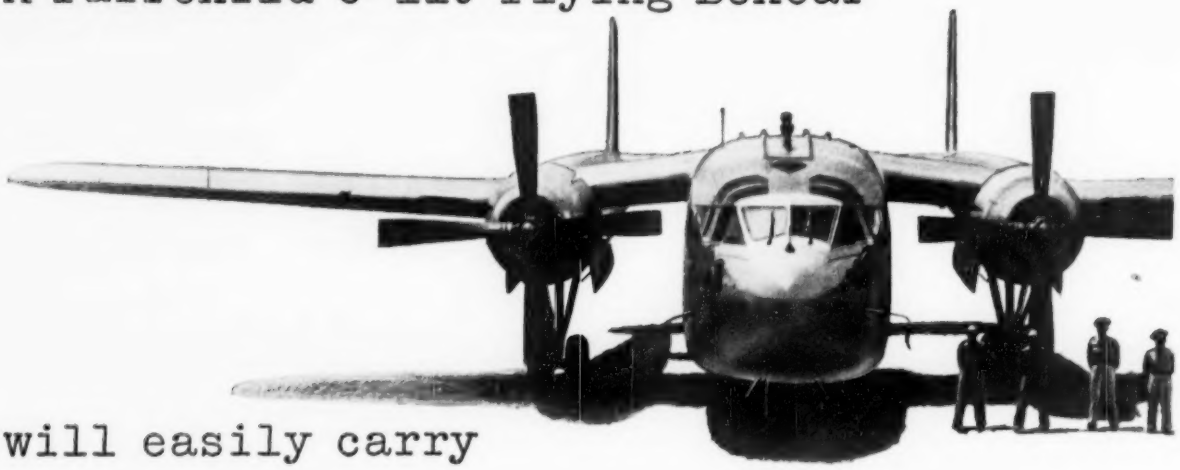
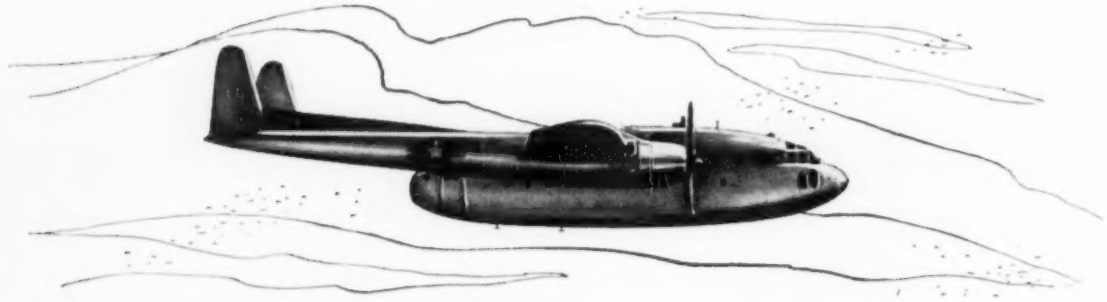


will easily carry

four 250 gallon water trailers (loaded)

plus eight supply men into forward combat

areas...and it is <u>being</u> done day after day!



ENGINE AND AIRPLANE CORPORATION

FAIRCHILD *Aircraft Division*

HAGERSTOWN, MARYLAND

Other Divisions: Guided Missiles Division, Wyandanch, L.I., N.Y. • Engine Division, Farmingdale, N.Y.

of fillets in both brackets and beams.

The use of a plastic material for the model being studied has been questioned on the grounds of physical properties. But the author points out that the stress-strain curve is linear for these materials, generally right up to the point of fracture. Fractures, when they occur, are brittle ones.

The only way in which the materials behave like plastics is in the presence of creep under load. This is handled by waiting until the rate of creep has become negligibly small, and then taking measurements.

So the stress distribution of the models is that which would occur in the prototype if the prototype material retained a linear stress-strain curve throughout the stress range.

▶ **How Good?**—Accuracy varies enormously with the problem, says Jessop, and it is impossible to lay down any general limits.

Optical measurements have very high accuracy, of course, and so the major errors come in the material, the construction of the model and the reproduction of the loading conditions.

The author says that of all these, the error due to reproduction of loading conditions is generally the most serious. There are relatively large strains produced in the model and these may tend to produce serious differences in applied loads.

As an estimate of accuracy, the author says that in a straight two-dimensional model, you might get the answer within one to five percent. This could raise to a possible 10 or 12% where there are unbalanced forces acting on hole boundaries, and to five to 30% when a three-dimensional model is used.

▶ **For the Future**—Jessop says that the continuous strain gage idea being studied at the College of Aeronautics is a promising method. The plastic is cast over the entire surface of the model, and the optical effect in the layer is observed by a reflection method.

This has been tested with a number of models, but accuracy and reliability have not yet been completely established.

The range of application will be limited by the difficulty of observation, says Jessop. But there is the possibility of measuring the amount and extent of plastic flow at the surface of a structure.

Survey Made of Arctic Starting Data

Recent emphasis on Arctic operation of Air Force materiel has focused interest on the problem of starting an engine on a cold day.

Many studies have been made and reported in technical meetings. Now Canada's National Research Council has compiled abstracts of the literature in a single place for ready reference.

The Council's report MP-9—"Literature Survey of the Effect of Sub-Zero Temperatures on Fuels and Lubricants"—covers the field, with particular emphasis on the part played by petroleum products. Although the general automotive field is covered, a specific section deals with reciprocating and turbojet aircraft engines, and chapters on greases and lubricants have universal application.

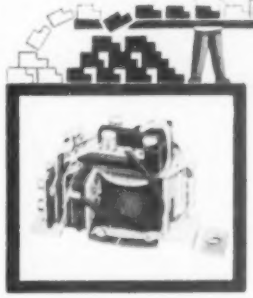
Latest date of any abstract in the survey is about October 1951.

THRUST & DRAG

Now that we've finally gotten interceptors that can be scrambled within a few minutes, we've acquired a new flying suit which takes half an hour to get into. Thus the eternal struggle of man versus machine continues.

Voice from the back of the room: "But why can't the pilots put these suits on in the morning and keep them on during the day?"

A good question, that, and here's an answer. All you have to do is to look



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COVER A WIDE RANGE OF APPLICATIONS . . .

For the operation and control of guided missiles multiple channel transmission is used to scramble channels and frequencies on which the control signal is sent. A Guardian *hermetically sealed* unit, designed for continuous switching, prevents interception of the missile by unfriendly hands.

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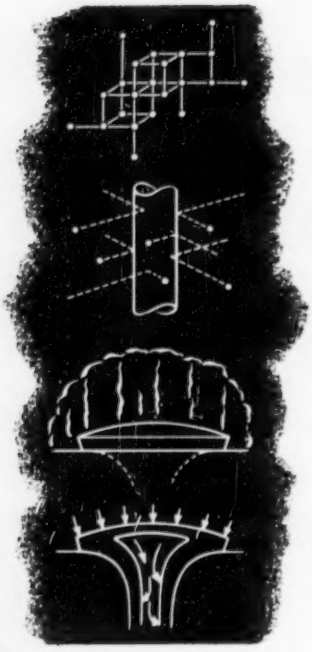
Here's why . . .



ALLOY

T.P.M. is the new valve material developed by Thompson to give greater corrosion resistance and higher strength.

SHOT PEENING

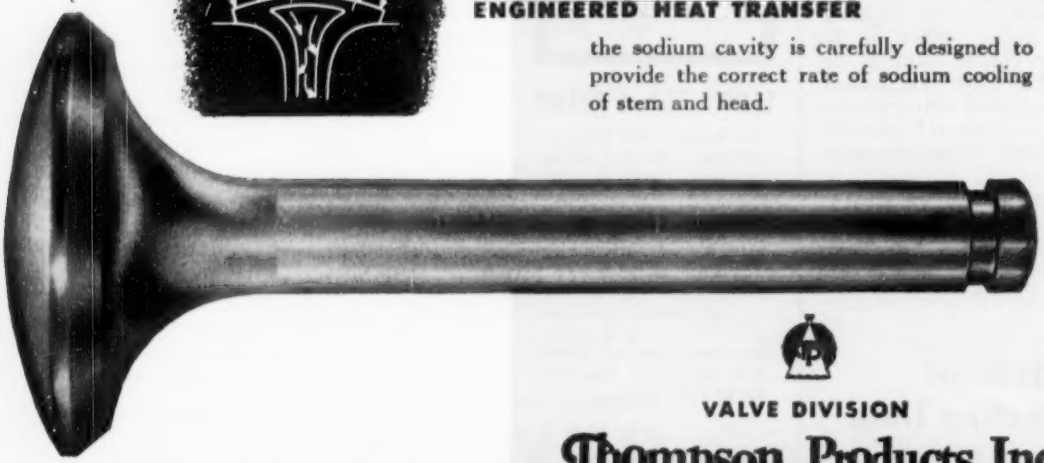
mechanically hardens T.P.M. stems to provide longer service with less wear.

CONTROLLED ATMOSPHERE

application of a Thompson-developed hard-facing material by arc-weld, assures a tough, homogeneous layer to resist high head temperatures.

ENGINEERED HEAT TRANSFER

the sodium cavity is carefully designed to provide the correct rate of sodium cooling of stem and head.



VALVE DIVISION

Thompson Products, Inc.

CLEVELAND 17, OHIO

at the pictures of Boeing's Tex Johnson wearing one of the new suits (Aviation Week, Oct. 13, p. 17). They fit tighter than the epidermis, and to wear one all day long must be about like wearing a too-small suit of long rubber underwear.

* * *

A few weeks back Arthur Godfrey's TV show featured a demonstration of the Navy's survival clothing for ditching or parachuting. Godfrey did a sort of reverse strip-tease in which he appeared in the nearest layer and then added on the items of equipment.

What with survival suit, Mae West, Parka, parachute and two helmets with face mask, earphones, mike and goggles, he was pretty well clothed at the end of the performance. It took four Navy pilots 2 min. to help him into all this.

Surely it's about time for some bright outfit to come up with a one-piece suit which has all this in one collection of fabric, straps and zippers. This suit could be in the airplane, set in place by the plane captain. The pilot gets in, sits on this suit, pulls straps over his shoulders, zips and zippers, and he's ready for emergencies.

* * *

The tenth anniversary of the first German V-2 firing has just passed. This great missile, progenitor of nebulous future generations of such weapons, set standards which still stand today.

At the recent annual convention of the American Rocket Society, one of the more outspoken missile engineers had this to say about the V-2s "If we had wanted a missile five years ago, we would have been forced to produce the V-2. If we want a missile today, we'd have to produce the V-2. And the thing I'm afraid of is that if we want a missile in five years, we're going to have to resurrect the V-2."

* * *

One of the speakers at the American Rocket Society meetings implied that more progress had been made in a shorter time with guided missiles and space travel than was made with the atomic bomb.

For the record: Nuclear fission—the principle of the atomic bomb—was discovered in 1939. The first atomic bomb was used six years later.

We have had seven and a half years since the end of the war to pursue the guided missile. We have had over 30 years of liquid-propellant rocket motor development and the same amount of time on the autopilot. We have yet to use a genuine, dyed-in-the-wool, unconverted-from-an-airplane guided missile in combat.

And we have certainly produced nothing comparable with the big bang that rocked Hiroshima. —DAA

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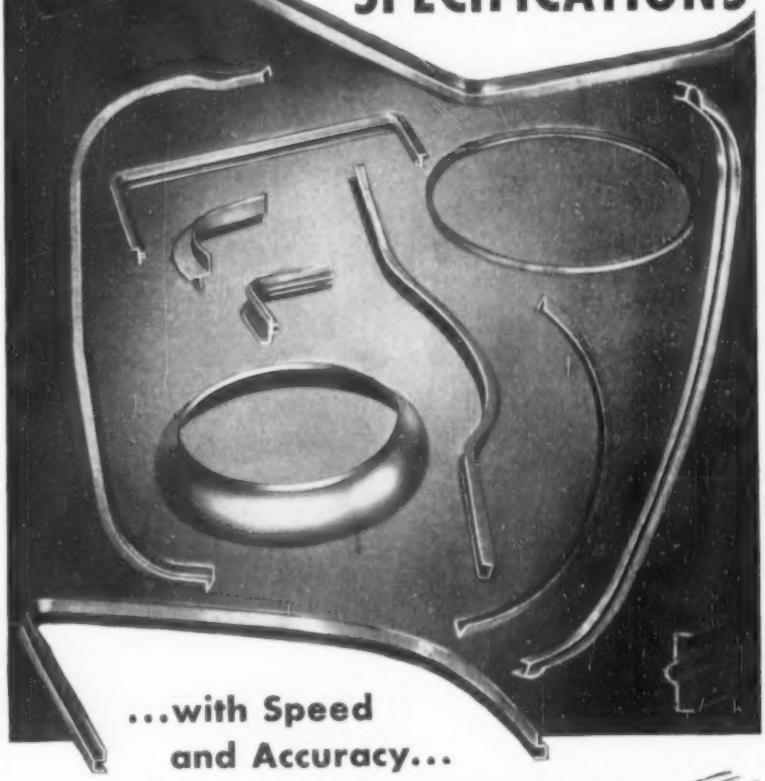
SPECIFICATIONS



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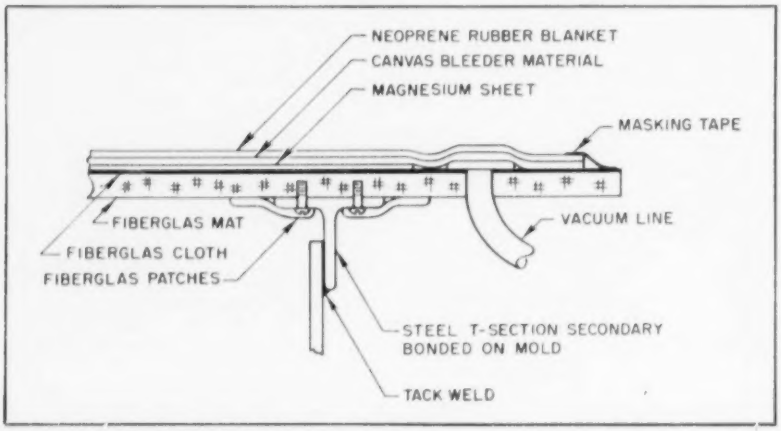


CHANCE VOUGHT-developed process which overcomes a major fabrication problem.

Sheet Magnesium Problem Licked

Low-temperature forming is made possible by use of Fiberglas mold and Neoprene blanket at low pressure.

The use of magnesium sheet in airframe construction has paid big dividends (AVIATION WEEK Dec. 29, p. 31). But the designer cannot always utilize the metal to best advantage, because of manufacturing problems involved.

One of these metal-forming difficulties was licked recently at Chance Vought Aircraft division of United Aircraft Corp. The division's production engineers have found that vacuum pressure and low oven temperatures can be used to form H-condition (hard-rolled) magnesium alloy sheet, and it has also been established that forming and bonding magnesium at the same time is possible.

Data on the procedure were furnished to AVIATION WEEK by Stanley Pelton of CV's production design engineering staff.

► **Temperature Factors**—As an example of the manufacturing problem involved, Pelton relates that Dow Chemical Co., to insure physical properties, recommends that its FS1-H24 alloy be formed at a maximum temperature of 300F, and be held at that temperature not more than 15 minutes. These limitations, Pelton claims, make stretchforming difficult and drop-hammer operations nearly impossible.

CV engineers found that when drop-hammering magnesium it was necessary to increase the working temperatures at the expense of the physical properties. Also, with existing equipment it was difficult to control temperature and time. In extreme cases on drop-hammered parts, it was necessary to redesign the parts for the annealed-condition magnesium or aluminum alloy—resulting in an increase in weight.

► **Fiberglas Mold**—Among the parts that gave trouble were large external panels. Redesign here could have been more serious than just an increase in metal gage. Any new approach to the magnesium forming problem, it appeared, would require heat and pressure, both accurately controlled.

Low-pressure laminating procedures indicated interesting possibilities, and CV's experience in this work made investigation relatively easy. Laminated Fiberglas molds and Neoprene blankets proved suitable for forming magnesium sheet. The sheet is located on the mold and fitted with a canvas bleeder material. This is covered with a Neoprene blanket tape-sealed to the mold. The air is pumped from between the mold and the blanket before the setup is put in an oven or autoclave. Using this procedure, magnesium gages from .02 to .102 have been formed and physical properties of the material have not been adversely affected, Pelton reports.

► **Conditions**—In the oven the setup is held under vacuum at 300F for 120 minutes. In the autoclave, pressure is 50-90 psi., temperature is 250-270F and time is 20-75 minutes.

Time at temperature is determined by the end results required. If a part must be to contour without springback, two hours in an oven is sufficient, Pelton says. If the part is to be used in a bonded assembly, the skin is formed just enough to give it the shape. Springback is removed during the bonding cycle.

Some assemblies are formed and bonded in one autoclave operation. This eliminates two stretchforming operations, with attendant savings in the labor and materials costs, and also insures an excellent fit between skin and doubler.

Compared with a drop-hammer tool for the same job, a Fiberglas unit affords considerable savings. For both labor and material, drop-hammer costs are about triple those for the Fiberglas molds, Pelton claims.

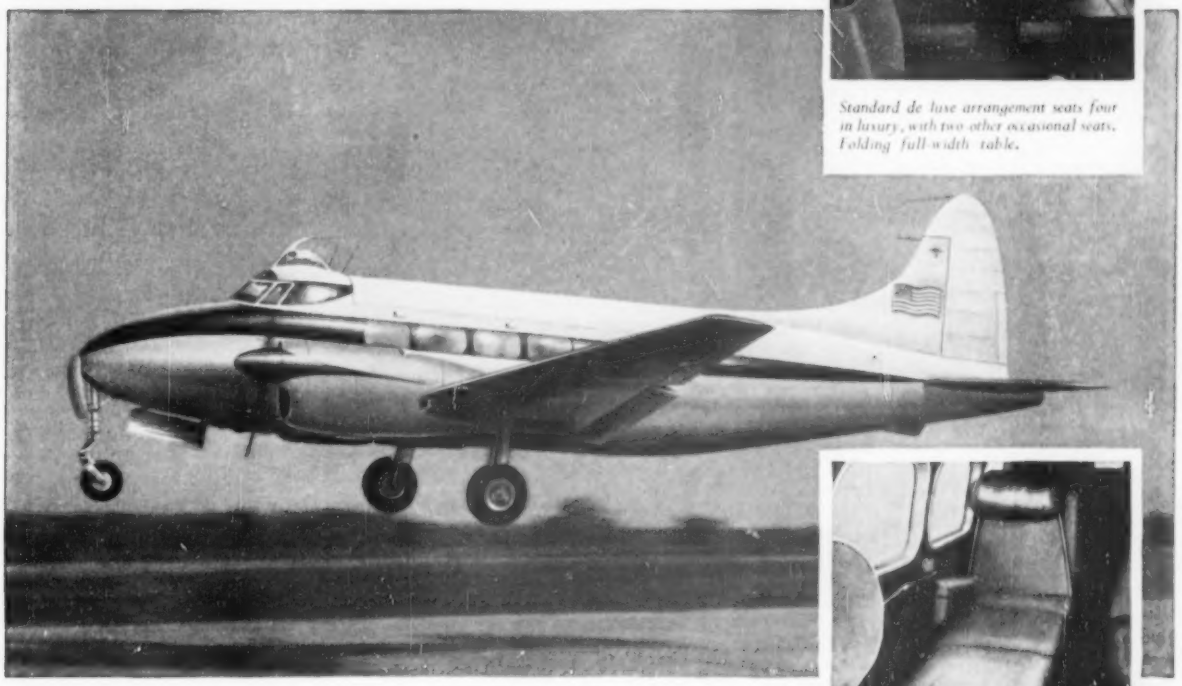
More Tool Capacity Is on the Way

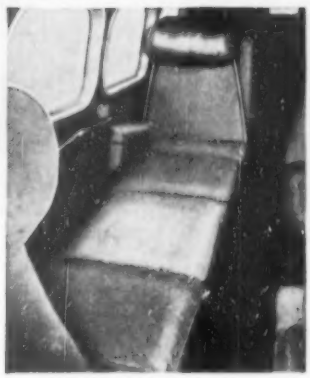
To keep pace with the need for increased machine tool capacity in the aviation and other defense industries, a special-machinery division has been created by Kearney & Trecker Corp., Milwaukee. To house the division, the

The DOVE

For the executive — an airliner in miniature

Standard de luxe arrangement seats four in luxury, with two other occasional seats. Folding full-width table.





Facing pairs of adjustable armchairs are quickly convertible into softly upholstered couches.

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Fifth and sixth seats for occasional use are located forward.

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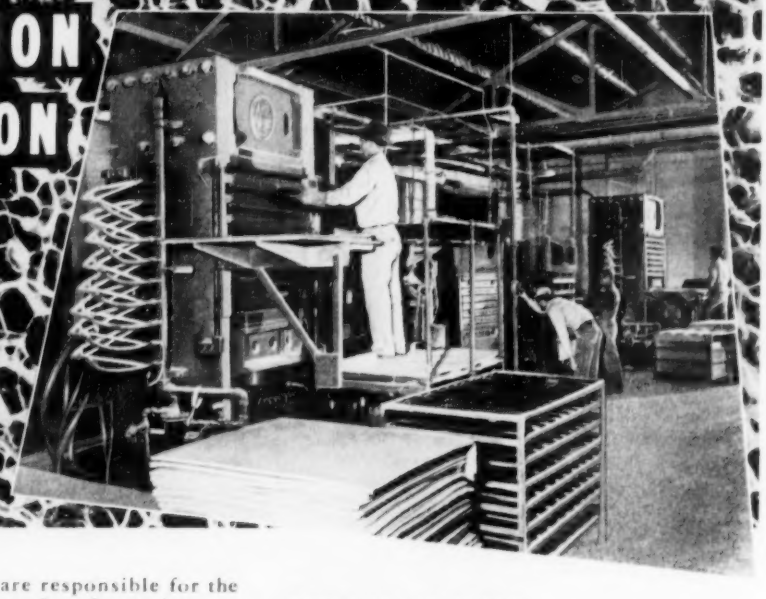

Battery of vulcanizing presses "bake" Rubatex to an optimum cure for product protection.

Closed cells are responsible for the structural strength and superior physical properties of Rubatex — not possessed by ordinary sponge rubber with open coarse cells which are wide open to oxygen and moisture.

Millions of nitrogen-filled cells, permanently sealed with tough live rubber, are "baked" in RUBATEX to give it superior air-tight, water-tight, and dust-tight qualities — making RUBATEX an excellent seal against these elements that continually plague industrial equipment.

A battery of vulcanizing presses, under carefully controlled conditions, "bake" RUBATEX to an optimum cure—"setting" it in its expanded and unique structural form. This final curing process, preceded by careful blending of specially developed compounding agents and calendering for uniform thickness — assure the best physical properties in RUBATEX to protect and extend the life of your product. In addition, RUBATEX is light in weight, soft, pliable, and easy to work with . . . adheres well to surfaces to which it is applied . . . does not score or craze plastics.

For maximum protection of your product — check the superior advantages of RUBATEX first!

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SPORTING GOODS — "Air cushioning" padding for athletic equipment and apparel.

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- Bath and kitchen mats

Send us details of your proposed applications and let us send you samples and recommendations. Write Dept AW-1, Great American Industries, Inc., Rubatex Division, Bedford, Virginia.

FOR AIR THAT PROTECTS—USE RUBATEX

RUBATEX CLOSED CELLULAR RUBBER

PIONEER MANUFACTURER OF CLOSED CELLULAR RUBBER ©

company will construct and equip a new plant, under authorization from the National Production Authority. No government funds are involved in the new construction.

Located in Milwaukee, the plant will have a total area of 193,000 sq. ft., of which 173,000 sq. ft. will be devoted to the production of projected huge special machine tools with electronic controls, photo-electric devices, three dimensional tracer mechanisms, etc. Plant is scheduled for completion in mid-1953 and machine tool delivery will be coordinated with the progress of the building, to facilitate production operations. About 60 of these large tools are expected to be installed.

Initially the project will be staffed with about 50 design engineers. Skilled machinists and assemblers will total about 320.

Annual output at first will be approximately $5 million. If sufficient sales potential is developed, production of the new plant could be doubled, it is reported, with space available for future expansion.

Defense Department will have first call on production from the new plant, but a great share of the production in the immediate future will be available for non-defense output. The company says it is free to take business from any source whatsoever.

Avro Shaper Speeds Jet Blade Output

A new shaping machine developed at A. V. Roe Canada Ltd., Malton, Ontario, is saving 20% of production time in turning out turbine and compressor blades, the company says.

Developed by Avro engineers, J. O. Creek and E. W. Dawson, the tool utilizes two cutters—one on each side of the workpiece—practically eliminating bending stresses. Supports for the blade and the pattern are pivoted to accommodate varying rake or incidence of pattern tracers and cutters, so that chatter doesn't occur.

Pneumatics hold the tracers in close contact with the pattern, and tracers are mechanically linked to the cutters. During the backward stroke of the tracers, the cutters are hydraulically disengaged from the workpiece. Automatic upward indexing is provided between the cutting strokes.

Titanium Studied for F-89D Scorpion Pods

Titanium is being investigated for application to F-89D Scorpion's rocket-firing wingtip pods, Northrop Aircraft reports. This component was selected under a USAF special engineering de-

For more than 18 years, Eclipse-Pioneer has been a leader in the development and production of high precision synchros for use in automatic control circuits of aircraft, marine and other industrial applications. Today, thanks to this long experience and specialization, Eclipse-Pioneer has available a complete line of standard (1.431" dia. X 1.631" lg.) and Pygmy (0.937" dia. X 1.278" lg.) Autosyn synchros of unmatched precision. Furthermore, current production quantities and techniques have reduced cost to a new low. For either present or future requirements, it will pay you to investigate Eclipse-Pioneer high precision at the new low cost.

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	Type Number	Input Voltage Nominal Excitation	Input Current Milliamperes	Input Power Watts	Input Impedance Ohms	Stator Output Voltages Line to Line	Rotor Resistance (DC) Ohms	Stator Resistance (DC) Ohms	Maximum Error Spread Minutes
Transmitters	AY201-1	26V, 400~, 1 ph.	225	1.25	25+j115	11.8	9.5	3.5	15
	AY201-4	26V, 400~, 1 ph.	100	0.45	45+j225	11.8	16.0	6.7	20
Receivers	AY201-2	26V, 400~, 1 ph.	100	0.45	45+j225	11.8	16.0	6.7	45
Control Transformers	AY201-3	From Trans. Autosyn	Dependent Upon Circuit Design				42.0	10.8	15
	AY201-5	From Trans. Autosyn	Dependent Upon Circuit Design				250.0	63.0	15
Resolvers	AY221-3	26V, 400~, 1 ph.	60	0.35	108+j425	11.8	53.0	12.5	20
	AY241-5	1V, 30~, 1 ph.	3.7	—	240+j130	0.34	239.0	180.0	40
Differentials	AY231-3	From Trans. Autosyn	Dependent Upon Circuit Design				14.0	10.8	20

**Also includes High Frequency Resolvers designed for use up to 100KC (AY251-24)

AY-500 (PYGMY) SERIES

Transmitters	AY503-4	26V, 400~, 1 ph.	235	2.2	45+j100	11.8	25.0	10.5	24
Receivers	AY503-2	26V, 400~, 1 ph.	235	2.2	45+j100	11.8	23.0	10.5	90
Control Transformers	AY503-3	From Trans. Autosyn	Dependent Upon Circuit Design				170.0	45.0	24
	AY503-5	From Trans. Autosyn	Dependent Upon Circuit Design				550.0	188.0	30
Resolvers	AY523-3	26V, 400~, 1 ph.	45	0.5	290+j490	11.8	210.0	42.0	30
	AY543-5	26V, 400~, 1 ph.	9	0.1	900+j2700	11.8	560.0	165.0	30
Differentials	AY533-3	From Trans. Autosyn	Dependent Upon Circuit Design				45.0	93.0	30

For detailed information, write to Dept. H.

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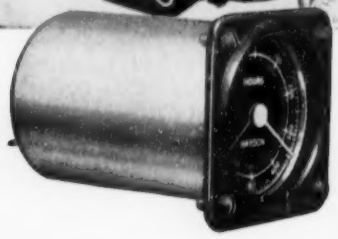

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The **HAYDON*** 7008 Elapsed Time Indicator indicates operating time of components with specific life or servicing requirements. This unit offers the unusual advantages of small size, hermetic sealing and 400 cycle operation for such applications as electronic devices, where tubes or other components should be replaced at specified intervals. Running time indicators can prevent unnecessary servicing, insure timely maintenance that protects against failure in operation.

HAYDON specializes in the manufacture of timing components for standard applications and in the design and production of custom-engineered timers for volume applications. The basic element of all **HAYDON** timers is our own rugged industrial-type motor which assures long, quiet operation. Their compact design and ability to operate in any position afford designers unusual latitude.

HAYDON also manufactures a variety of timers specifically designed for 60 cycle, 400 cycle or D.C. operation in military applications. The 5103 Series "trigger-trip", hermetically sealed Time Delay Relays are available in a wide range of delays from seconds to hours.

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Write for information you need: catalogs on motors or devices; bulletins on D.C. motors, 400 cycle motors, time delay relays, and elapsed time indicators.

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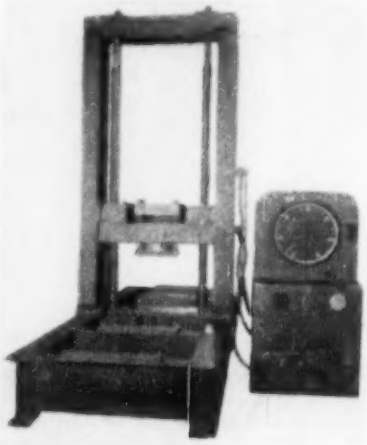
sign contract because its makeup involves the greatest variety of forming, machining, welding and other fabrication techniques of any composite unit of comparable size, Northrop says.

The contract calls for redesign of the pod to determine fabrication methods and engineering data necessary for the use of titanium. Laboratory research, already underway for the project is furnishing metallurgical, physical and structural data on commercially pure titanium and some of its available alloys.



Universal Machine Tests Large Parts

A new universal has been developed for testing large aircraft structures such as bridging members and wings. It will permit a working capacity on a finished machine pad bed 4x15 ft., according to the manufacturer.

The 200,000-lb., floor-type machine is made of welded steel. Its crosshead is driven by a Thymotrol motor mounted on the crosshead itself instead of at the bottom of the unit. The crosshead is raised or lowered on fixed screws.

Speed range of the motor is 20:1, with an overall loading speed of .025 to 0.5 in./min. and a high traverse speed of 15 in./min. Eccentric loads are made possible by special flexure plate construction in each plane.

The machine is available to industry in the general price range of standard table-type universal testing machines.

Young Testing Machine Co., Skelton Bldg., Bryn Mawr, Pa.

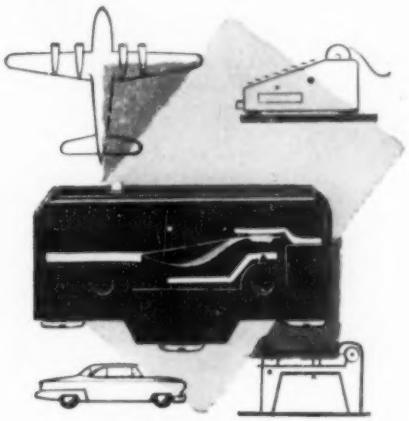
R-R Plant for Australia

(McGraw-Hill World News)

Sydney, Australia—Rolls-Royce of England has announced it will build an aircraft factory here for repair and service of its Dart and Avon jet engines. The factory is expected to be in full production in 18 months.

Better Products Thru Better Design

how product-design engineers, working with MICRO engineers, prove that "the use of MICRO Switches is a principle of better design".



The hardest working men today are in the great research laboratories of America.

There, spurred by dissatisfaction with present materials, machines and methods, they are working ceaselessly with chemical, electrical, electronic and mechanical forces to improve existing processes and products.

Their findings are then passed on to thousands of skilled design engineers who convert them into practical reality.

High on the list of versatile components available to these design engineers in this conversion, is the small, lightweight, highly precise MICRO switch, made in more than 6000 different combinations.

Time after time, not only in the design of new products, but in the redesign of existing products, design engineers have proved that "the use of MICRO switches is a principle of better design." Here are a few examples:

* * * *

To meet ever-increasing demands for speedier and more efficient machines in plastic-molding departments throughout industry, one molding-machine manufacturer—with MICRO engineers cooperating—completely redesigned his product, making it fully automatic through use of 14 MICRO switches! These switches make possible twelve timing, limiting and safety operations within 33 seconds—a speed never previously approached. Many progressive manufacturers have built their own molding departments around this redesigned machine. Result: faster and more accurate production at lower cost because of better design.

* * * *

In aircraft design, MICRO precision switches have proved spectacularly successful. Today, few airplanes are manufactured on the American continent that do not incorporate MICRO units in their design—from a few in small planes to over 100 in large commercial carriers and military bombers. Certain newer MICRO models (including the "subminiature," with its almost incredibly small size and weight and its outstanding performance characteristics) have brought further reductions in vital size-and-weight factors. MICRO engineers cooperate closely with the aircraft industry in anticipating the requirements of this fast-moving field.

* * * *

Among the fundamental problems of the timer industry has been the maintaining of accurate, consistent repetition of a pre-selected time interval in the timing control. Formerly, this was accomplished by cumbersome, expensive mechanisms. Today, thanks to MICRO precision switches, the process has been made simpler, more positive, less costly and less susceptible to mechanical failure. Small, high-capacity MICRO switches, with their almost everlasting repeatability of a precise operating point, have facilitated compact and streamlined design—and new efficiency—in timing controls. Further proof of what can be done when design engineers and MICRO field engineers work together.

* * * *

So it goes throughout industry—"Better Products Thru Better Design"—fresh evidence, convincing proof that "the use of MICRO switches is a principle of better design"!

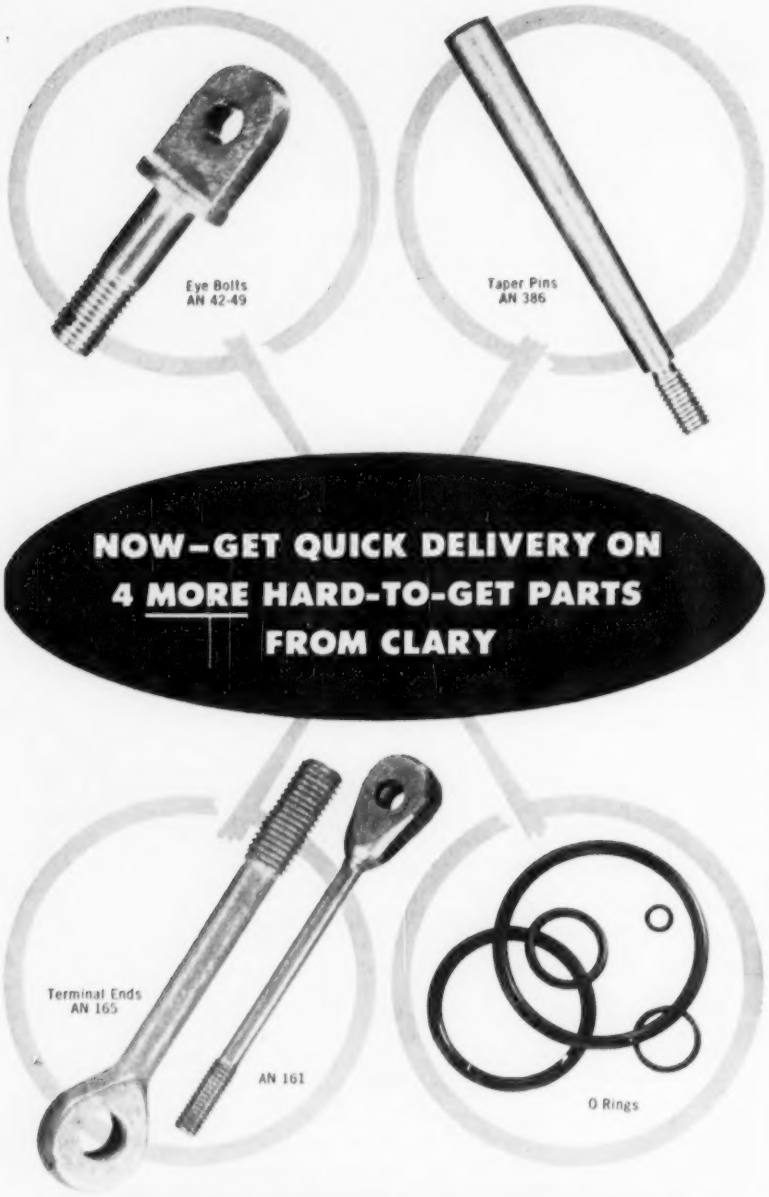
MICRO

MAKERS OF PRECISION SWITCHES

FREEPORT, ILLINOIS

A DIVISION OF

MINNEAPOLIS-HONEYWELL REGULATOR COMPANY



FOUR NEW ADDITIONS TO CLARY'S HUGE STOCK

of Bonded AN and NAS hardware are just four more reasons why you save time by calling Clary first.

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New Fastener Seals Gas Casings

A patent for a quick-acting, self-locking fastener, designed mainly to secure water- and gas-tight casings, has been awarded to William Dzus, of Dzus Fastener Co. It is already in use in avionic and other airborne applications.

The fastener can be grasped by its enlarged head, so no screwdriver is necessary. It takes less mounting space than required for the receptacle and spring usually associated with fasteners of this type, as a small wire in a milled slot replaces that portion.

When the fastener is closed, springs in the head of the fastener bear down to keep the casing tightly sealed.

Dzus Fastener Co., Inc., Babylon, N. Y.

Shock Padding For Plane Parts

A new shock-resistant blanketing material has been developed by Calresin Corp. to give improved protection in packaging of delicate aircraft parts, both lightweight and heavy.

Calresin says the polyvinyl chloride compound, known as CPC, also can be used as crash padding.

It can be used under Arctic weather conditions and formed or molded into virtually any shape, the manufacturer claims. The material is non-flammable, fungus-proof and can be bonded to any known surface.

Calresin Corp., 333 N. Santa Anita, Arcadia, Calif.

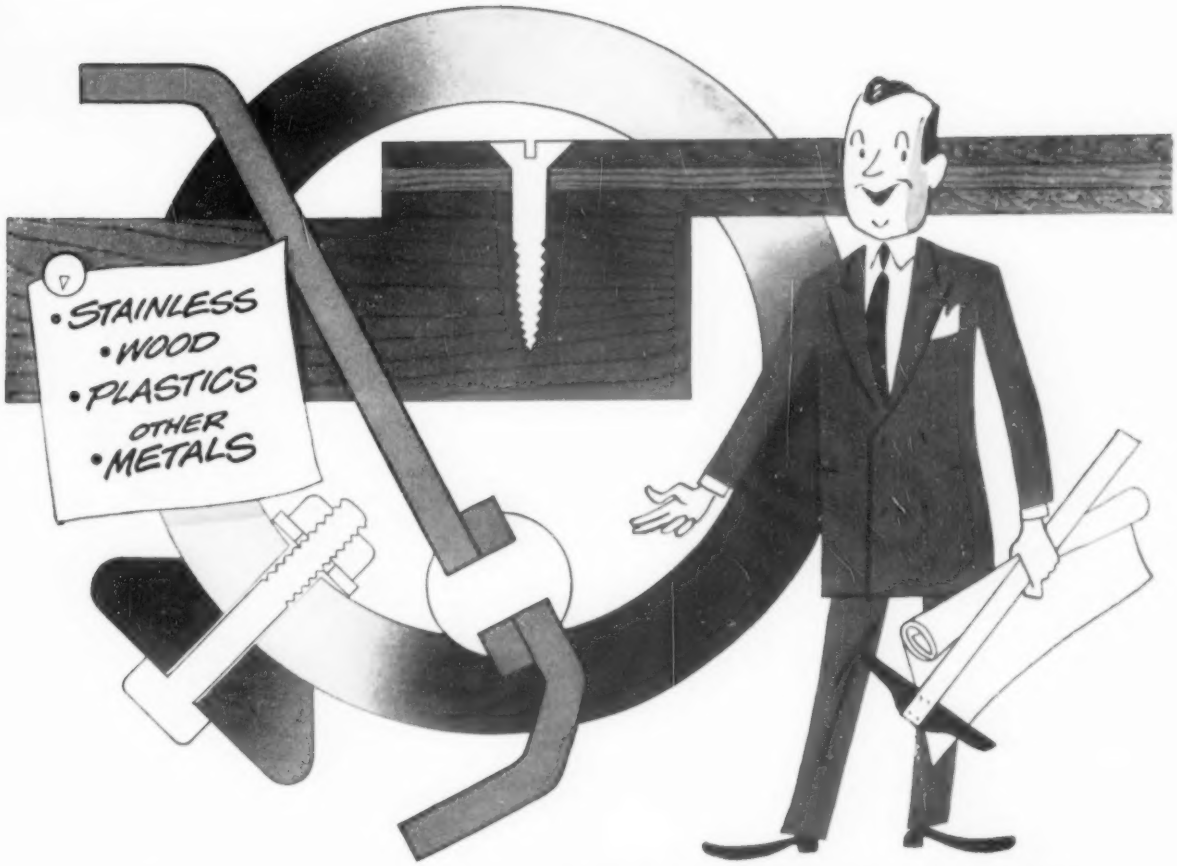
PRODUCTION BRIEFING

► **D & R (Donofrio-Roosevelt) Industries, Inc.**, have moved to new quarters covering more than 25,000 sq. ft. at 2360 West Jefferson Ave., Detroit. The firm packages and processes aircraft parts for domestic storage and export shipment to the armed forces.

► **Norge Aircraft division** of Borg-Warner Corp., Muskegon, Mich., has received a contract from General Motors to build parts for the F-84F Republic Thunderstreak, Muskegon, Mich.

► **Western Fibrous Glass Products Co.**, Los Angeles, has been appointed West Coast distributor for Resistoflex Corp., Belleville, N. J., manufacturer of aircraft and industrial hose assemblies and plastic products.

► **Vickers El Segundo division**, 2160 East Imperial Highway, El Segundo, Calif., has expanded its facilities for designing and producing aircraft hydraulic



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for Better Looks – Longer Life

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A complete line of stainless steel fasteners—all types and sizes of bolts and nuts, rivets, wood and machine screws, cotter pins, washers, etc.—are made of Allegheny Metal by the leading manufacturers in this field. Get in touch with them for catalogs and prices, or write us direct.

ADDRESS DEPT. AV-37

Allegheny Metal fasteners are non-rusting, non-staining. They will last as long as, or longer than, the materials they join. You can count on them to stand up through the years—both in strength and in bright good looks.

Best of all, stainless steel fasteners can be used anywhere. It isn't necessary that the materials to be joined are stainless—these corrosion-proof fasteners are the perfect answer for joining other metals, woods, or plastics.

Fasteners made of Allegheny Metal are produced in complete variety—every type and size that your job requires.

For improving quality and reliability wherever they're used—and for the economy of lifetime service—specify fasteners made of the time-tested stainless steel, *Allegheny Metal.* ● For any technical data or engineering help in the use of stainless steel, address *Allegheny Ludlum Steel Corporation, Henry W. Oliver Bldg., Pittsburgh 22, Pa.*

You can make it **BETTER** with

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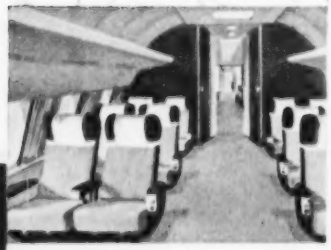
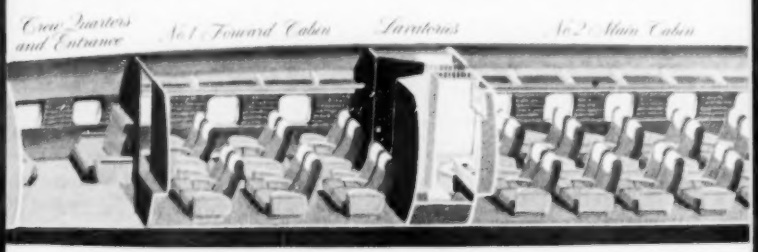
Here is an airliner so different you'll be eager to fly on it again and again—fast, dependable, spacious and luxuriously beautiful—the world's finest airliner. Counseled by famous industrial designer Henry Dreyfuss, Lockheed has created a completely new interior atmosphere for airliners catering to world travelers who appreciate non-stop schedules. In service in 1953 between America and Europe on KLM, Air France and Trans-Canada Air Lines—will also span the world's other oceans for Air India, AVIANCA, Braathens, Iberia, LAV, Pakistan International and Qantas. At your first opportunity insist on *Super Constellation* service.



Forward Cabin—**Cabin No. 1 has fully reclining, adjustable chairs—deep cushioned, roomy, relaxing. As throughout the plane here is the comfort appreciated in non-stop travel.**

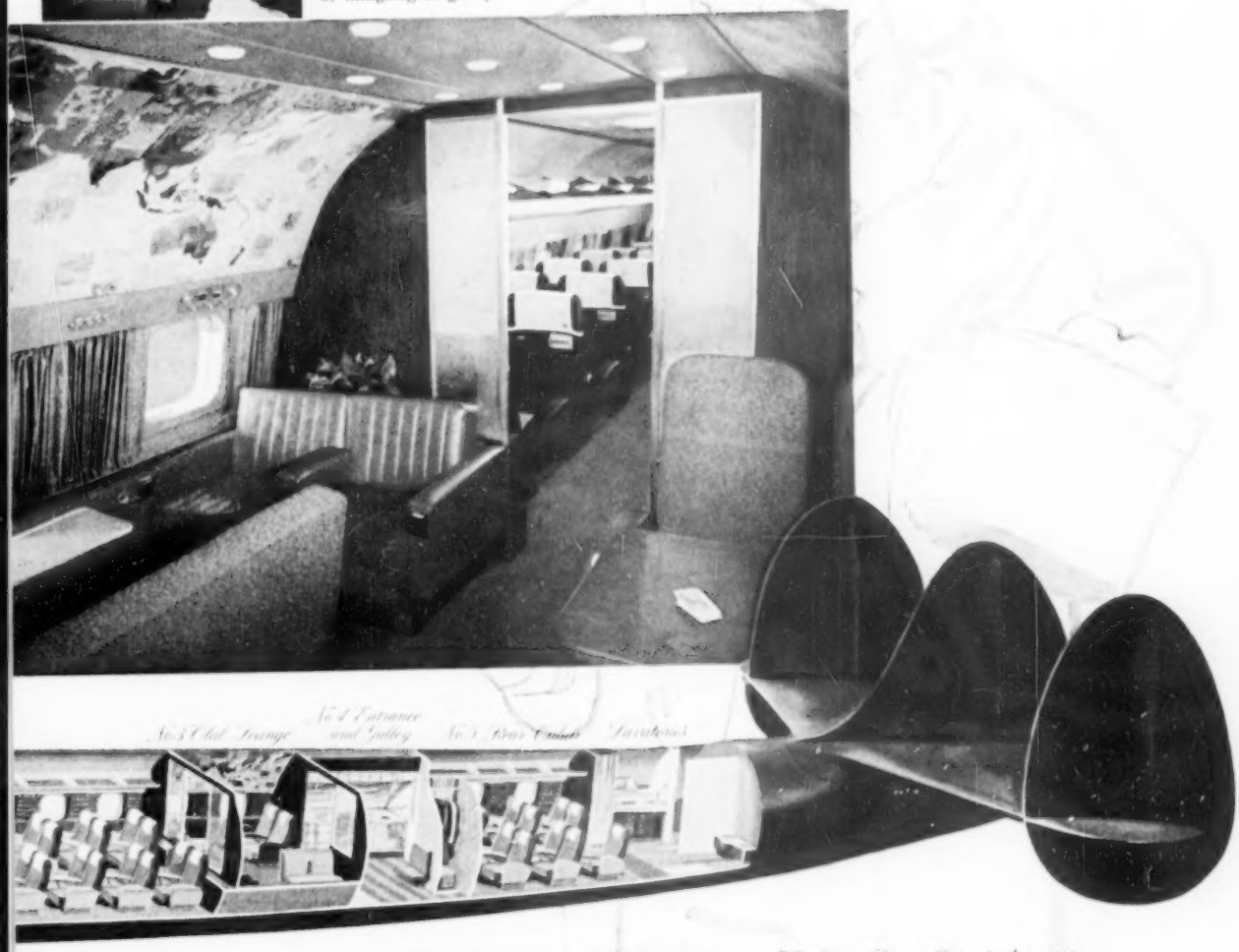
Main Cabin—**Cabin No. 2 with its extra wide aisle and broad ceiling affords unusual spaciousness. Beauty of line and color matches that of the other cabins.**

The Super Constellation **is the longest, largest, finest airliner ever built—with 4 superbly appointed passenger cabins, a luxurious lounge, galley and bar, 4 lavatories, crew's quarters, pilot's cabin—all air conditioned. Compartmentization creates a solid feeling of sturdiness never before achieved in any airliner.**



LOCKHEED
Super Constellation

Club Lounge—Cabin No. 3 is far the most unique, attractive and comfortable lounge designed for any airliner. Variety of seating allows privacy for 4 couples or mingling of groups.



Galley and Bar—Cabin No. 4 has ample space for several attendants, assuring quick service. Can be curtained off when used as entrance way.

Bar Cabin—Cabin No. 5 offers a full length view of the plane's beautiful interior with its mahogany paneling, modern lines and restful color harmony.

The Super Constellation is the most flexible airliner ever built. Converts in a few hours from first class accommodations to a high density tourist transport or partial cargo carrier.

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AIRCRAFT OXYGEN BREATHING EQUIPMENT

THE SCOTT "A-15"

Portable Automatic Diluter Demand Oxygen Walk-Around Assembly.

Standard equipment on U.S.A.F. bombers, cargo and personnel carriers. New units in production and available to airplane manufacturers.

FLASH!
THE NEW SCOTT A-21 PORTABLE PRESSURE DEMAND OXYGEN UNIT WILL SOON BE AVAILABLE

TECHNICAL DESCRIPTION

U. S. A. F. Type A-1 Cylinder and Regulator Assembly consists of: U. S. A. F. Type A-15 Low Pressure Diluter Demand Oxygen Regulator. (Designed and produced by Scott. Automatically mixes air and oxygen, supplying correct air-oxygen ratio for all altitudes up to 34,000 feet.)

AND . . . U. S. A. F. Type A-6 Low Pressure Portable Oxygen Cylinder.

RE-CONDITIONING

. . . SCOTT AVIATION is also equipped and approved by U.S.A.F. to process surplus A-15s.

MODEL 5500 — Portable. Furnishes supplementary Oxygen for passengers or crew. Scott 8600 Econo-Mask shown.

for Passenger Comfort and Protection as Supplementary Oxygen.

MODEL 5600
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for Crew Protection in Smoke or Fumes. Microphone can be added to mask if desired.

8500 FIXED OXYGEN SYSTEM

FOR ALL AIRCRAFT

"from a Cub to a Connie", providing a complete oxygen system including supplementary oxygen for crew and passengers, demand oxygen for smoke and fume protection for crew. Its regulator (shown above) is the lightest in existence and supplies required oxygen up to 30,000 ft. for up to fifty outlets.

SCOTT OXYGEN FLOW INDICATOR #8540

Indicates oxygen flow. Inserts in tubing of any constant-flow mask (B.L.B., ABB, SCOTT ECONO-MASK, etc.). A flow of approximately 1 L.P.M. causes a red float to disappear. Operates in any position.

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6000-B1-O PORTABLE

For crew protection in smoke or fumes. Supplies 100% oxygen for a minimum of 15 minutes.

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Export: Southern Oxygen Co., Inc., 157 Chambers St., New York 7, New York

equipment. Vickers' new 100,000-sq.-ft. plant at Joplin, Mo., began production of aircraft components last August.

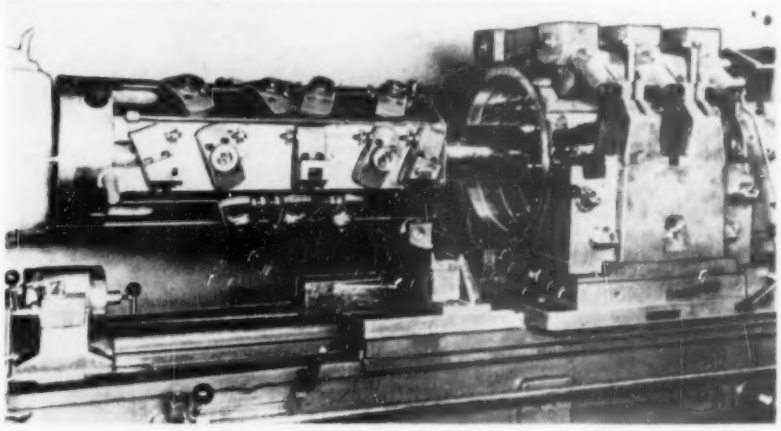
► **Northrop Aircraft's** new 72,000-sq.-ft. concrete warehouse in El Segundo, Calif., will be completed by Feb. 1, 1953.

Fast Writeoffs

Accelerated tax amortization for manufacturers expanding their defense facilities is granted by the government in the form of certificates of necessity.

In the following list of recent certificates, company name is given, followed by product or service, cost of construction deemed necessary for defense expansion, and the percentage of the expansion cost allowed for fast writeoff. Fast writeoff permits property to be depreciated in five years.

- **Beacon Machine Co.,** East Hartford, Conn., aircraft parts, $35,000, 45%.
- **C&L Precision, Inc.,** Stamford, Conn., aircraft parts, $16,146, 70%.
- **New York Air Brake Co.,** Watertown, N. Y., aircraft parts, $159,375, 65%.
- **Buffalo Pattern Works, Inc.,** Buffalo, N. Y., patterns for aircraft and ordnance parts, $30,689, 70%.
- **Holsman Manufacturing Co.,** Cuyahoga, Ohio, aircraft and ordnance parts, $13,871, 70%.
- **Burroughs Adding Machine Co.,** Plymouth, Mich., aircraft instruments, $220,525, 65%.
- **Electric Auto-Lite Co.,** Toledo, aircraft components, $1,637,500, 40%.
- **Ryan Industries, Inc.,** Detroit, aircraft instruments, $98,002, 45%.
- **Briggs Manufacturing Co.,** Detroit, aircraft parts, $38,000, 40%.
- **Flour City Ornamental Iron Co.,** Minneapolis, aircraft components, $17,223, 70%, and $79,540, 70%.
- **Luscombe Airplane Corp.,** Garland, Tex., aircraft assemblies, $412,000, 45%.
- **Vaino A. Hoover,** dba Hoover Electric Co., Los Angeles, aircraft components, $143,506, 60%.
- **Douglas Aircraft Co., Inc.,** Bell, Calif., airplane subassemblies and parts, $64,673, 55%.
- **Williams Heater Co.,** Madison, Ind., aircraft parts, $104,992, 65%.
- **General Motors Corp.,** Indianapolis, aircraft parts, $130,318, 65%.
- **Dynamic Air Engineering, Inc.,** Los Angeles, aircraft parts, $145,000, 45%.
- **Rivco, Inc.,** Downey, Calif., aircraft parts, $156,278, 70%.
- **Wedgelock Co.,** No. Hollywood, Calif., aircraft parts, $219,277, 70%.
- **Lockheed Aircraft Corp.,** Los Angeles, airplanes and parts, $140,250, 40%.
- **Harford Mfg., Inc.,** Culver City, Calif., aircraft parts, $50,912, 70%.
- **Marman Products Co., Inc.,** Los Angeles, aircraft parts, $655,792, 50%.
- **Voi-Shan Mfg. Co., Inc.,** Culver City, Calif., aircraft parts, $92,808, 55%.
- **Cooper Precision Products,** Los Angeles, aircraft parts, $552,380, 70%. (This figure subject to deletions, not determinable at this time.)
- **Nemec Combustion Engineers,** Whittier, Calif., aircraft components, $174,906, 45%.
- **Bendix Aviation Corp.,** Burbank, Calif., aircraft parts, $48,200, 60%.



German Boring Tool for Jet Work

A recent contribution of Germany to jet production is a boring machine being sold in this country by Morey Machinery Co., Inc.

The tool, developed by Alfing Kessler Werke, will completely machine out a jet engine compressor case, according to Morey. (New German machines have been observed by AVIATION WEEK editors in conspicuous numbers in England, France and other European countries where there is aviation activity.)

This design has a boring bar of rigid construction. It has a temporary support during loading. Tool slides are mechanically actuated and hydraulically controlled.

Compressor sections, normally produced in halves for casting purposes, are clamped together in a fixture on the machine by means of self-locking, spring-loaded blocks. The carriage then advances the work over the boring bar. The boring bar is inserted in an outboard support bearing and the temporary support is retracted.

Cylindrical, tapered or combined bores, end faces, T-slots and other grooves can be machined.

Morey Machinery Co., Inc., 410 Broome St., New York 13.

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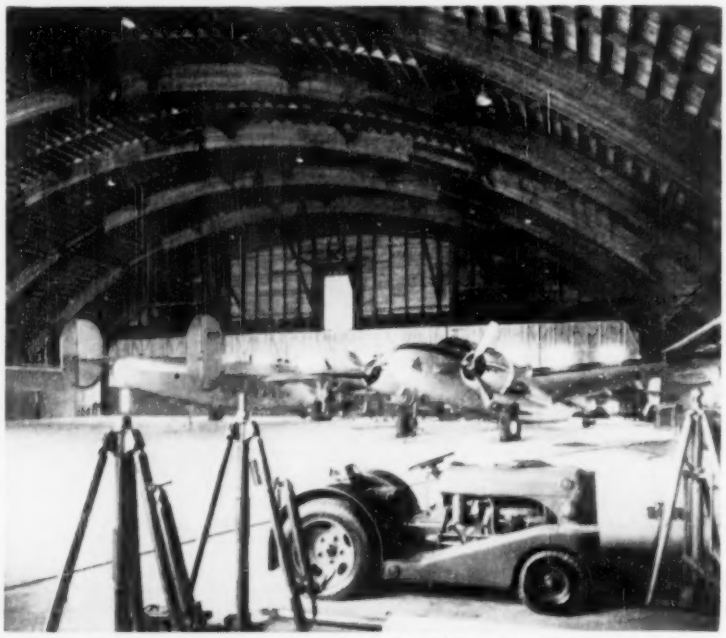
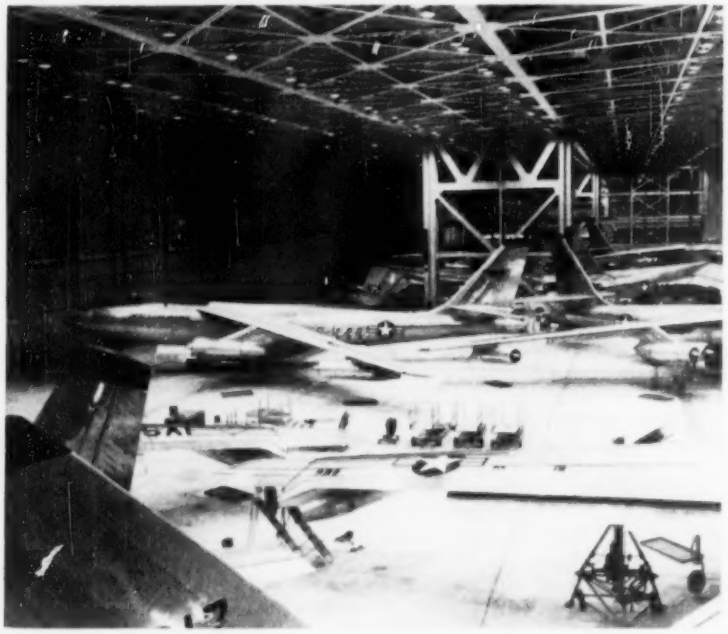
Aviation Week Picture Brief



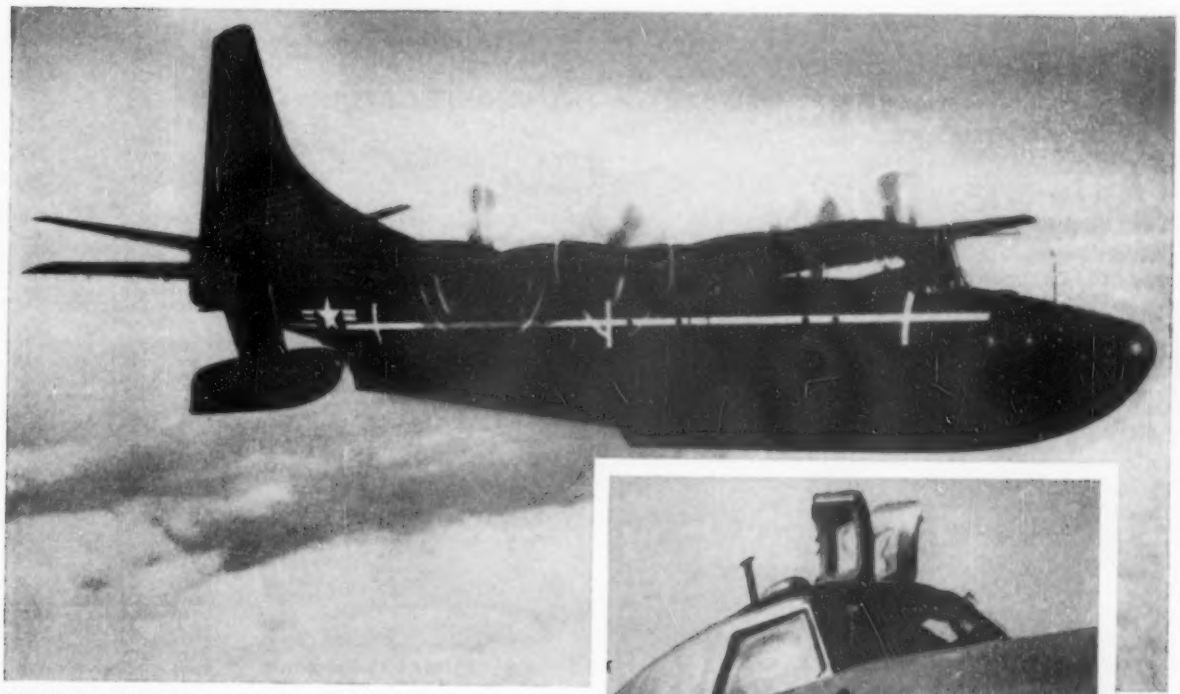
WOOD The six main elliptical glue-laminated Douglas fir arches in this new Continental Can Co. hangar at Morristown, N. J. (believed the world's largest), span 180 ft., are 48 ft. high in the center. Wigton-Abbott Corp., Plainfield, N. J., designed and built it. Timber Structures, Portland, Ore., fabricated the arches.

Unusual New Hangar Designs

STEEL Boeing's new $4.5-million flight hangar at Wichita can accommodate 12 B-47s, is one of the largest of its type. Cantilever construction, with all support at center, permits unobstructed movement through the hangar. Building, part of $32-million expansion program at Wichita, took 5,250 tons of steel.



Advanced design of Convair's big P5Y-1 calls for SAFETY GLASS by PITTSBURGH



CONVAIR'S NEW P5Y-1 soars over San Diego, Calif. on a recent test flight. The plane, the world's first turboprop seaplane, was designed and built at the San Diego Division of Consolidated Vultee Aircraft Corporation.

CLOSE-UP of the cockpit, showing the cockpit windshields and pilot's windows, glazed with Pittsburgh Safety Glass.

WITH cruising speeds in excess of 350 miles per hour and a rate of climb that is faster than that of some World War II fighters, Convair's new 60-ton P5Y-1 seaplane represents a whole new conception of the functions of water-based aircraft.

Reflecting trends in the finest and most advanced aircraft designs, the P5Y-1 has electrically-heated Pittsburgh NESA Glass in the entire frontal area, including both the pilot's and co-pilot's windshields. Pilot's sliding windows are pressure-bearing, offset-type Pittsburgh Flexseal.

Years of research and testing—including the building of a powered 1/10th scale model—went into design of the P5Y-1, and glass and glazing techniques received their share of attention. Pittsburgh aircraft glass specialists worked closely with Convair's engineers in determining the Pittsburgh Safety Glass that best fitted the plane's functions and operating characteristics.

When you have a problem involving aircraft glass and glazing techniques, it will pay you to bring it to "Pittsburgh." Experience gained on a majority of the nation's military and commercial aircraft is available to you here. Pittsburgh Plate Glass Company, Room 3130, 632 Duquesne Way, Pittsburgh 22, Pa.

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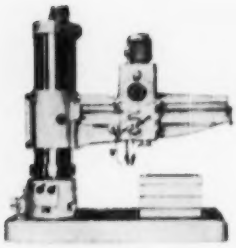
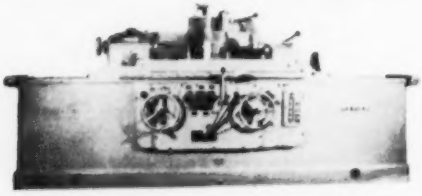
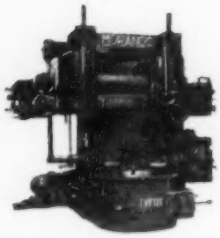


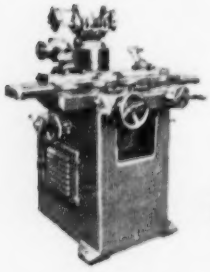
CASER RADIAL DRILLS
3', 4', 5', 6', 7', 8', 10'



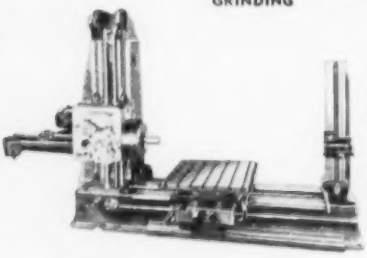
POLYGON GRINDER, EXCEPTIONALLY VERSATILE MACHINE. UNIVERSAL CYLINDRICAL, EXTERNAL, INTERNAL, ELLIPTICAL, TRIANGULAR & SQUARE GRINDING



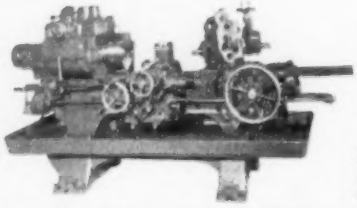
MORANDO 55" VERTICAL BORING MILL, MODEL TVK120, WITH THREE HEADS, AND 61" SWING WITH SIDE HEAD BELOW TABLE TOP



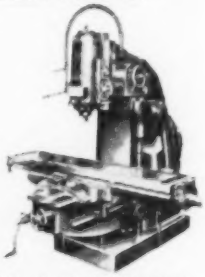
MODEL RA NO. 2 UNIVERSAL TOOL & CUTTER GRINDER



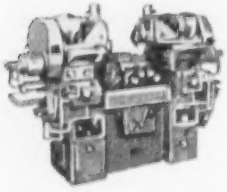
HORIZONTAL BORING MILLS—TABLE & FLOOR TYPES. 2½", 3", 3¾", 4", 5", 6", 8", 10"



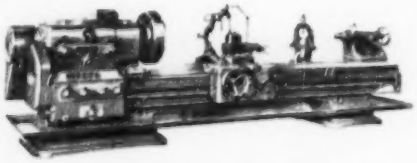
MINGANTI TURRET LATHES. NOS. 3, 4, 1A, 2A, 3A. ALSO NEW RAM TYPE AUTOMATIC CYCLE, TYPE 40E



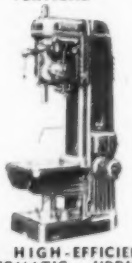
NO. 4 DI PALO DIAL TYPE HIGH-SPEED VERTICAL MILLING MACHINE • AVAILABLE ALSO: NOS. 2, 3, 4, 5, 6, PLAIN, UNIVERSAL & VERTICAL



AMI-600 BOREMATIC HORIZONTAL HYDRAULIC BORING MACHINE, WITH SINGLE OR OPPOSED SPINDLES AND MULTIPLE SPINDLES TO SUIT



MORANDO ENGINE LATHES—FROM 16" TO 168" SWING, WITH CENTERS FROM 40" TO 110". AVAILABLE WITH HYDRAULIC DUPLICATING ATTACHMENTS IF DESIRED



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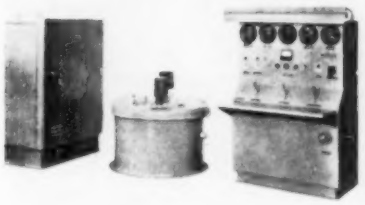


Stand Spin-Tests Jet Assemblies

Stands for spinning jet engine assemblies to determine their mechanical soundness and vibration characteristics are being produced in several models by Warren Bros. Mfg. Co.

The equipment will spin turbine rotors, fan impellers, compressor rotors, accessory turbines and other rotating parts in the engine at higher speeds than they normally encounter in service. Stands include a spin pit, control panel and service cabinet.

The largest stand, in which the spin pit is sunk in concrete up to the top cover, can take an assembly weighing 2,500 lb. and measuring nearly 5 ft. in diameter and whirl it at 25,000 rpm. Smaller sections can be tested up to 100,000 rpm.

Parts to be tested are mounted in a balanced arbor installation in the spin pit's cylindrical drum. A turbine drive, either steam or air driven, is mounted on the top cover. Air is evacuated from the drum to reduce heat due to air friction.

Test operations are carried out from desk-shaped control panel which incorporates pressure gauges, electronic frequency meter, vacuum pump and lube system controls. Switches also are included here for a magnetic chuck for the test assembly and for the turbine drive. The service cabinet houses vacuum pumps, their drive motors and controls.

Warren Brothers Mfg. div. of Warren Brothers Roads Co., Cambridge, Mass.

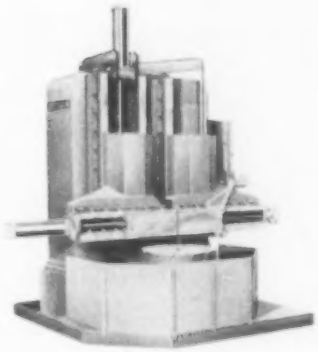
Helicopter Light

An incandescent lamp has been developed by Westinghouse Electric Corp. which has its filament braced so it can withstand angular accelerations up to 200G.

The lamp is used as a leading light on the tip of a helicopter blade which swings the bulb through a 48-ft. circle at 270 rpm. The light's capacity to take this crack-the-whip treatment is "surprising when it is realized the tungsten filament is operating not far below the softening point," Westinghouse says.

The filament is in three sections that form three sides of a rectangle, with each corner rigidly braced.

Westinghouse Electric Corp., 401 Liberty Ave., Pittsburgh 30, Pa.



Contour Machine

Ex-Cell-O, maker of jet engine production equipment, has produced a precision vertical contouring machine.

The tool is designed for fast, accurate machining of large, round parts such as jet engine compressor wheels. Identified as Style 426-A, the machine is capable of precision contouring, boring, turning, facing, grooving and rabbeting. Simple controls enable an unskilled operator to turn out accurate work, Ex-Cell-O claims.

Both horizontal and vertical movement in contouring operations is controlled by a tracer finger that follows a form on a hardened, ground-flat steel template. The tracer is carried on the horizontal member of a right-hand compound slide on the machine.

Both vertical and horizontal members of the right-hand contouring slide are operated through ground lead screws driven by variable-speed motors. Electronic controls keep feed per revolution constant throughout the cut regardless of variations in the contour or table speed, Ex-Cell-O says.

A left-hand compound slide consists of a vertical slide, supporting a horizontal tool slide, both hydraulically operated. The vertical slide provides feeds for turning boring and rabetting. Facing and grooving is done during the feed stroke of the horizontal slide. Seven automatic cycles are possible on the left-hand compound slide. Normal

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machine cycle includes operation of both compound slides in sequence.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

Precision Power For Computers

A new, highly precise, high-power d.c. source, designed especially for the exacting requirements of digital and analog computers, business machines and other complex electronic devices, has recently been developed by Inet, Inc., Los Angeles, Calif.

Known as the Precision Power Supply, the unit has a degree of performance regarded by the maker as unprecedented, and is expected to have major influence on the future design and application of many types of electronic equipment.

This magnetic amplifier-selenium rectifier power supply has been developed in order to simplify design and increase efficiency and reliability of equipment requiring very closely regulated direct current.

Inet engineers claim that extensive tests demonstrate the unit's performance. It provides dynamic regulation of better than 0.2% with wide load and alternating current line changes. Steady state regulation proved to be less than 0.15% from no load to full load, with plus or minus 10% a.c. line voltage. Rms. ripple can be filtered as low as 0.01%; with 0.5% as standard.

The Precision Power Supply is said to require about half the space of many types of equipment with comparable performance, and is housed in a single compact cabinet, or can be built with dimensions to customer's specifications.

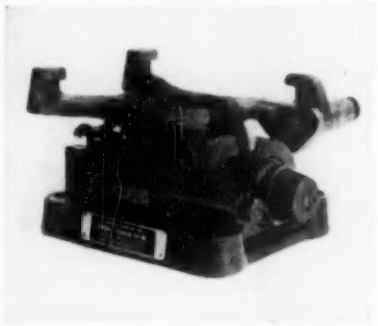
The unit is designed for trouble-free duty service, with no moving parts or electronic power tubes. The selenium rectifier-magnetic amplifier design eliminates thyratrons or ignitrons. Thus the equipment is designed to require the minimum of maintenance and parts replacement.

Because of its high efficiency of approximately 75%, the unit has sufficiently cool operation to reduce refrigeration requirements in office-installed computers, Inet says.

I. B. Serge, Inet research chief, who supervised the development of the unit, points out that a computer is activated by "spikes"—extremely rapid jumps or drops in voltage—and it therefore cannot function properly if the power supply creates artificial spikes because of changes in the load or in the a.c. line. The instantaneous dynamic regulation of the new Precision Power Supply eliminates bulky and inefficient compensatory elements which have previously been required in computers and business machines, he claims.

Standard ratings of the Inet Precision Power Supply range from 6 to 500 v. d.c., and from 5 to 200 amp. The equipment also can be built with other ratings to suit customer's specifications.

Inet, Inc., 8655 So. Main St., Los Angeles 3, Calif.



20-MM. CANNON MOUNT

Improved rear mount for 20-mm. cannon is designed for easy access to boresight adjusting points. These permit alignment of gun in azimuth and vertically with ordinary wrenches. Release knobs are also located conveniently at the sides and no tools are required to remove gun. First units are being delivered to Lockheed. Maker is Stephen-Douglas Co., Inc., 2950 Nebraska Ave., Santa Monica, Calif.

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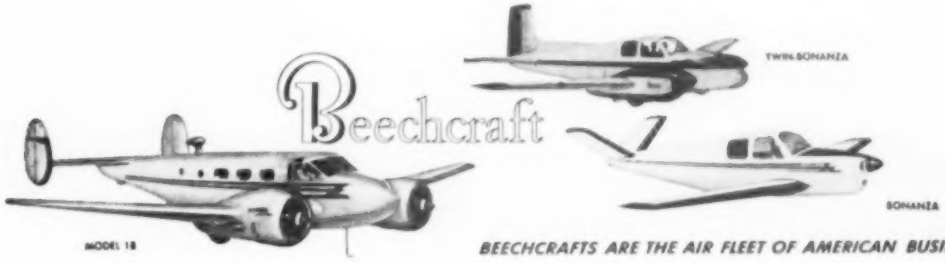

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LETTERS

From de Havilland

As the builders of the Comet jet airliner, we are surprised to read in your Nov. 10 issue that some disagreement may be looming in America over certification of the Comet 3s ordered by Pan American.

Between countries which enjoy the respect and confidence of each other surely these need be no divergence of national view as to the airworthiness of a vehicle which has satisfied all the technical requirements of the official authority in its own country.

Any different attitude would amount to an expression of want of confidence in national ability to take care of the safety of the traveling public, and it is unthinkable that any nation in the world can doubt British ability, out of its centuries of experience, in this basic element of civil life.

The feeling in Britain is that the Civil Aeronautics Administration of the United States, backed by public American opinion, accepts this fundamental principle. If there should be expressions against basic American certification of the Comet, we know that they cannot be general and cannot be founded upon the facts of the situation as internationally recognized.

These facts are thoroughly well known to all concerned. The Comet has not been allowed special concessions in regard to satisfying airworthiness standards of the British Air Registration Board. Those standards are as high as any in the world. The volume and length of experience with jet engines and jet aircraft in England, and with airline operation since 1919, and quantity aircraft production since 1914, founded upon the great heritage of engineering achievement in Britain, since the beginning of the industrial revolution, left no chance for inadequacy in the establishment of test requirements by the ARB when work on a jet airliner seriously commenced in 1946.

Since Comet flight trials began on July 27, 1949, the Comet 1 has been subjected to the whole schedule of the ARB tests in England and in the tropics and has been found a safe and airworthy craft for public service. Accordingly, a British Certificate of Airworthiness was awarded on Jan. 22, 1952, after no less than two-and-a-half years of test flying, route proving and crew training.

The type has been in public service since May 2, 1952, and by now has satisfactorily flown for many thousands of hours in the ordinary routine of the airways network. Comets are at present flying more than 80,000 miles a week.

There could never be in England the slightest reluctance to certify as basically airworthy an American aircraft which had this history. Even to suggest any hesitancy would be regarded here as a slight on American standards of public safety. There might, of course, be small detail requirements which could be complied with by modification, but they could not affect the main issue.

All the experience to date in the operation of jet-propelled passenger aircraft has been British experience. In volume and in technical performance it has been abundantly adequate to establish the Comet for world-wide service to world-accepted standards of public safety.

That fact is well recognized in all circles in America. If accepted officially, it can be implemented without difficulty. Indeed, if it were not accepted, then no United States carrier could ever purchase the Comet 3; because the purchase must be made a year or two before a Comet 3 could be submitted for trials to satisfy the American certification requirements.

We know full well that would not be the wish of the American people. We hope that America will be happy to accept and use British aircraft, including major airliners, just as Britain has been glad to use American Aircraft in recent years. A free interchange of merchandise, culture and people between our countries is necessary in our common interests; and we believe that there is no more reticence in the employment of British vehicles of public transport in America than there is in regard to the use of British motor cars, worsteds or tableware.

The Comet is a practical contribution to Britain's strength as an air power and a bulwark against disturber's of the peace. We are your staunch friends, and we hope that you will use our products and our services liberally, and so enable us to reciprocate.

M. SHARP,
Public Relations Manager
De Havilland Aircraft Co. Ltd.
Hatfield, Hertfordshire,
England

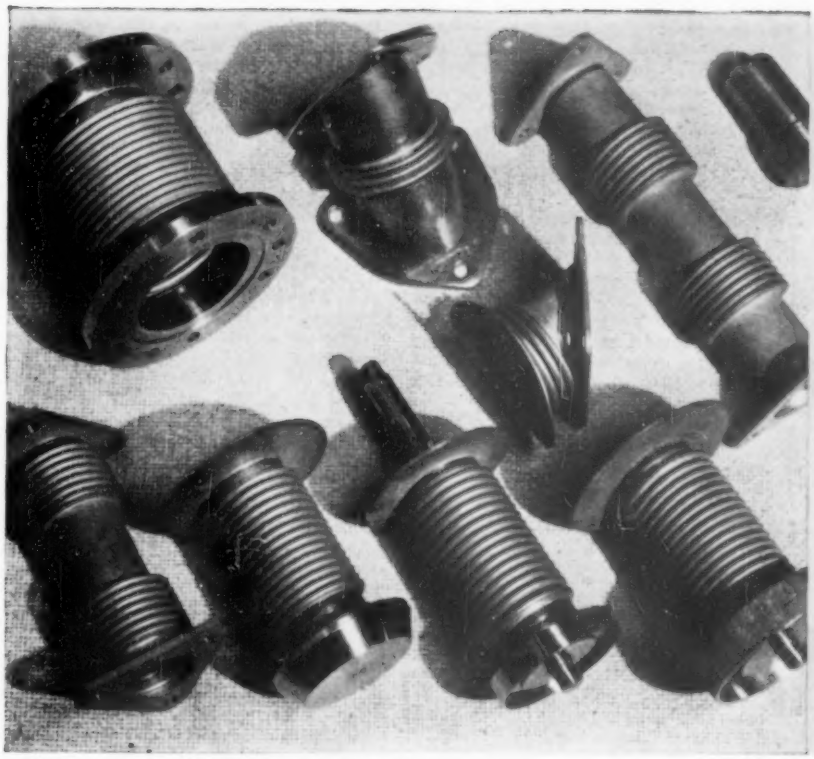
Missed Approaches

Your statement in "Why So Many Missed ILS Approaches?" in a recent Avonics story which says, "a missed approach unnecessarily exposes the aircraft to the hazards of approach, places an additional burden on the local traffic system, and entails a difficult go-around maneuver under instrument flight conditions," is very misleading.

"Missed approach" is probably one of the most improperly used terms in aviation, and oftentimes is used in an attempt to degrade the ability of the airline pilot.

The reason this maneuver is executed is because, in the mind of the pilot, should the approach be continued at the prescribed low altitude it would entail an unsafe operating condition. Whatever the causes for the decision to abandon the approach are, the decision is still made in the interest of safety.

It is recommended in your article that pilots should continue a little after they are doubtful as to the outcome of the approach, in the hope they will see something and then a wild maneuver can be executed down near the ground in order to land successfully. Nothing makes the passengers "happier" than to (go) through an aerial ballet while approaching an airport and then experience the "thrill" of being



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jolted to a halt on these air-carrier-type strips in use today.

You are misrepresenting the facts when you infer the abandoned approach is dangerous. On the contrary, this maneuver is a well-coordinated procedure executed to prevent the possibility of an accident. So far as the load increase on traffic control is concerned, this is negligible. Procedures now in effect require an area to be constantly available for an aircraft to proceed to in case an approach is abandoned.

If all agencies charged with providing traffic separation were properly staffed, this go-around could be handled without any undue incident.

Approaches are abandoned primarily because the weather is not as reported. This point is agreed to by all concerned, however, what constructive steps have been taken to improve this condition? The only method a pilot has to determine the weather is by descending to his minimum altitude. Because he then exercises sound judgment by abandoning the approach, and returning to a safe altitude, he is then considered to have missed his approach, even though the weather is less than reported.

Many approaches are abandoned when precipitation is present (because) "25-cent" windshields, windshield wipers, de-icing and de-fogging equipment do not provide the pilot with sufficient visibility. What constructive program has been undertaken to remedy this situation?

The figures as used by Region I do not mean a thing to me as they include approaches made at Washington and Idlewild. Any approach on the instrument runway at these airports is made under the worst conditions. The pilot group has long ago made very clear its opinion of the slope line system.

There is no doubt in my mind (that) the automatic coupler or some similar unit has a place in aviation as an aid. It will be interesting to note the operation when some of the airlines have this equipment on board.

If the weather reporting system and the windshield problem are not improved, the benefit of the new (approach coupler) equipment will be negligible.

You will still have the approach abandoned because the windshield wipers did not serve their purpose, or because the windshield was fogged or iced up. You still would have the approach abandoned when the minimum altitude is reached and nothing is seen. And the pilot would still be faced with the problem of abandoning the approach in the interest of safety because he would know the instrument is not perfect, and certainly would not continue the approach when a doubt as to the successful completion exists.

J. D. Smith, Pilot
Capital Airlines
22 Tallow Lane
Levittown, L. I., N. Y.

(A planned go-around is unquestionably less hazardous than a let-down below minimum altitude when the pilot hasn't made visual contact. However, if the pilot does make visual contact before reaching his minimum only to discover that he is not in position to make a landing, the resulting go-around does present an additional hazard compared to a successful in-position approach and landing. This was the idea we intended to convey in the sentence to which Capt. Smith refers.

Nor did we in any way intend to urge pilots to "continue a little after they are doubtful as to the outcome of the approach." Our article emphasized the CAA Region I admonition that "(Nothing) should be said or implied or done which would overemphasize landing to the detriment of safety."

The article cited considerable evidence that both CAA and Sperry reports recognized that inaccurate weather data are responsible for many of the missed approaches. In fact, the article pointed out that Sperry, in its analysis of "coupling failures," used only CAA data for reported ceilings of 500 ft. and higher in order to allow for a possible unfavorable discrepancy of 200 ft. between reported and actual ceilings. Sperry assumed, and with some justification, that any missed approaches at reported ceilings of 500 ft. and higher were definitely attributable to poor ILS beam coupling.

The recent Air Navigation Development Board contract to Sperry (referred to in the Aug. 25 article) calls for the study and development of new techniques and equipment to permit improved weather reporting.

This should prove a "constructive step" toward solving one of the problems which Capt. Smith cites—Philip Klass.)

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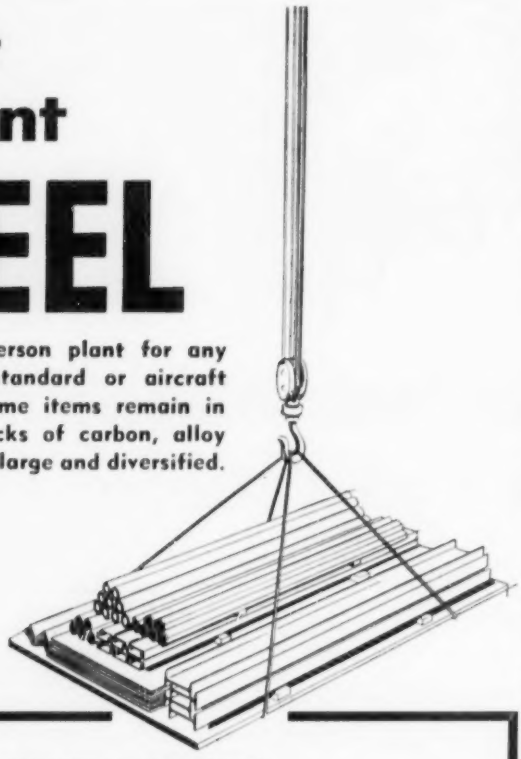

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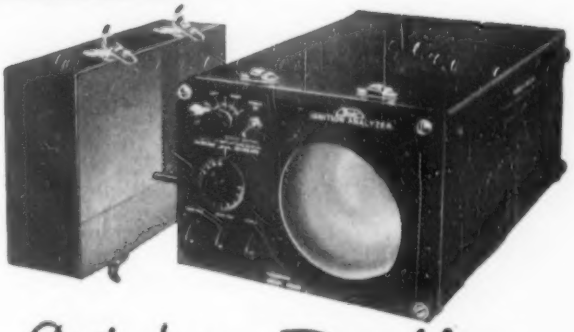

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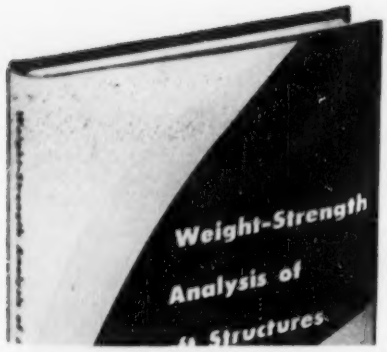

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AVIATION SAFETY

CAB Accident Investigation Report

Cargo C-46F Crash Near Idlewild

Investigation discloses that probable cause of the Jamaica, N. Y., crash of a USAF C-46F leased to U. S. Airlines, Inc., was sudden engine failure caused by a deteriorated fuel feed diaphragm. Pilot, copilot and three persons on the ground were killed.

Here is CAB's official report:

THE ACCIDENT

A C-46F aircraft, N 1911M, owned by the United States Air Force and operated under lease by U. S. Airlines, Inc., crashed at Jamaica, N. Y., on Apr. 5, 1952, at about 0827.[1] The only occupants, two pilots, were killed, as were three persons on the ground. Five other persons were injured, four buildings were destroyed, several automobiles were damaged, and the aircraft was destroyed by impact and subsequent fire.

HISTORY OF THE FLIGHT

The flight was designated as No. 4-2 because it was being operated as the second section of a regularly scheduled cargo flight that left Fort Lauderdale, Fla., on Apr. 4.

Flight 4-2 departed Fort Lauderdale Apr. 5, 1952, at 0055, with a crew consisting of Captain William B. Crockett, Jr., and Copilot Jack L. Woerderhoff. The destination was Teterboro, N. J., with intermediate stops at Charleston, S. C., and Raleigh-Durham, N. C. The gross weight of the aircraft upon departure was less than the maximum of 48,000 pounds permitted in cargo operations, and the load was placed so that the aircraft's center of gravity was within prescribed limits. This first segment of the flight was conducted according to visual flight rules. It was entirely routine with a landing at Charleston at 0328. Fuel was added but no cargo was loaded or discharged at Charleston.

Takeoff from Charleston was at 0410, with a flight plan calling for instrument flight rules.

Again the gross weight was less than the allowable and the center of gravity was within prescribed limits. This segment of the flight was also routine, with a landing at Raleigh-Durham at 0524. Again the cargo remained unchanged although 284 gallons of fuel were added.

At Raleigh-Durham the pilots were briefed at the office of the U. S. Weather Bureau on current and forecast weather conditions over the route. It was indicated that no difficulty should be encountered en route to the New York area, but the ceilings and visibilities there and at Philadelphia, the alternate, would be 800 feet and five miles with heavy rain upon arrival.

At 0554 the crew filed a flight plan according to instrument flight rules to cruise from Raleigh-Durham to New York International Airport (Idlewild) at 3,000 feet. The original destination, Teterboro, was changed because of worsening weather there, and the alternate was Philadelphia International Airport. The estimated time en route was two hours and ten minutes. The aircraft carried fuel for four hours' flight. The 0528 weather sequence reported Idlewild, the destination, as 2,100 feet ceiling and 4-mile visibility, and Philadelphia, the alternate, as also above minimums.

Upon departure from Raleigh-Durham at 0608 the aircraft's gross weight was about 172 pounds less than its maximum allowable of 48,000 pounds, and its center of gravity was within prescribed limits. The flight proceeded uneventfully at its planned altitude of 3,000 feet. Routine position reports were made through Air Route Traffic Control and arrival over the Idlewild range station was estimated at 0810. At 0809 the flight was instructed by ARTC (Air Route Traffic Control) to climb to 3,500 feet and to contact Idlewild Approach Control when over Scotland Intersection (where the southwest leg of the Idlewild range intersects the southeast leg of the Newark range).

The next instruction to the flight was from Idlewild Approach Control and directed it to hold at Scotland at 3,500 feet, and to expect approach clearance at 0828. The flight reported over Scotland at 3,500 feet at 0817. Immediately following, the flight was given Idlewild weather as follows: "Weather 0804, time now 0817, measured 500 broken, 1,800 overcast, visibility 1½ miles in heavy rain, the altimeter 29.82."

The approach controller first saw the flight on the airport surveillance radar (ASR) when it was approaching Scotland. He asked the flight if it could make a straight-in approach from its present position and the flight replied affirmatively. It was then cleared for a straight-in approach, instructed to descend immediately, and to report passing through 2,500 feet. The flight acknowledged and subsequently reported leaving 2,500 feet, and then leaving 2,000 feet. The controller then cleared the flight to continue descent, to advise upon reaching 1,500 feet, and then cleared it to "pass over Runway 4 and make left turn into Runway 13 left."

The next contact with the flight was at 0825, when it reported "contact" over the outer marker, located at the Idlewild range station, 2.9 miles from the approach end of Runway No. 4. The local controller then took over control of the flight and advised it to "bear left and make a right turn into Runway 13L, that's the big runway on the north side of the airport, and

[1] All times referred to herein are Eastern Standard and based on the 24-hour clock.

call base leg coming up on the Federal Building. Go ahead and you'll probably be west of the Federal Building when you call." This was acknowledged by the flight, which presumably intended to comply because the message was not questioned.

At 0827 the local controller saw the aircraft below the overcast and at an estimated altitude of 500 feet, between the tower and Runway 4. He at once transmitted, "Just saw you pass over the airport. You should be passing those hangars now. If you start your left turn and watch the hangars on your left wing, you'll be able to make a left turn into Runway One Three. Go ahead, sir." The landing gear appeared to be fully extended, but the flap position was not noticed.

A few seconds later the aircraft disappeared from view on a northerly heading and still at an estimated altitude of 500 feet. The local controller at once asked the flight if it had started the left turn, and the flight replied that it was pulling up to execute a missed approach. The tower gave immediate instruction to turn right and proceed to Long Beach Intersection (the SE leg of the Idlewild Range and the SW leg of the Hempstead Range, about 10 miles SE of Idlewild) at 1,500 feet altitude. This transmission was acknowledged. This was the last communication from the flight. A very short time later the aircraft crashed at the intersection of 169 St. and 89 Ave., Jamaica, N. Y., about 4.4 miles north of the Idlewild control tower.

INVESTIGATION

The altitude of the aircraft during its final approach was determined by observation of its path in the precision approach radar (PAR, or precision scope). Unlike the previously mentioned ASR which does not indicate altitude, the latter indicated altitude, deviation in azimuth, and distance. Its operator had the flight in sight on the scope when it was about seven miles from the runway. He saw it level out at an altitude of about 500 feet when approximately one-half mile in from the outer marker where it had given its last position report. He continued to observe the approaching aircraft until it passed beyond the limit of his scope at a point approximately one-third up Runway 4 from the approach end. The approximate 500 feet altitude was maintained during this period. This PAR is the scope used for ground control approaches (GCA) and to monitor instrument landing system (ILS) approaches. Neither service was used by the incoming flight, inasmuch as the carrier is not authorized to use either at Idlewild. The carrier's operating specifications call for only visual approaches below 500 feet and with a minimum visibility 1½ miles.

Statements were taken from 40 persons who saw or heard the aircraft immediately before the crash. One of these 40 was at the airport and confirmed the tower operator's testimony that the aircraft passed across the airport heading in a generally northerly direction, at an estimated altitude of about 500 feet; that the landing gear was extended and engine noise seemed normal.

The 39 remaining witnesses were located along the approximate final two miles of the flight path. Some of them were ex-

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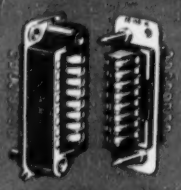

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tremely close to the crash site. Only a few of these 39 persons saw the aircraft, and they saw it only for a very short interval of time. All 39, however, heard unusual noises.

Nine of these witnesses were further examined at the public hearing in connection with this accident. The consensus of their testimony, as well as that of witnesses who did not testify, indicates that both ceiling and visibility were close to zero, and that rain was falling at the time and place of the accident. It also indicates that when the aircraft was first seen by them below the overcast, it was in a sharp right bank and descending rapidly.

Testimony also indicates that engine noise diminished, came on with an unusually loud roar momentarily, again diminished, and came on again with a similar extremely loud roar, whereupon impact occurred. The impact site is at an elevation approximately 150 feet higher than Idlewild Airport.

Investigation also determined that at the time of impact the gross weight of the aircraft, based on its computed weight[3] upon departure from Raleigh-Durham and probable fuel burn-off, was approximately 45,750 pounds. This was 2,250 pounds less than its certificated gross weight of 48,000 pounds. The amount of fuel on board at the time should have been enough for about one hour and 40 minutes of flight.

The through cargo was of miscellaneous materials and totaled 13,740 pounds. Testimony of personnel who loaded the aircraft at Fort Lauderdale indicates that this cargo was properly secured. The carrier's operations manager testified that he had never received reports of cargo shifting in flight.

In regard to the weather: testimony from the captains of 17 flights that took off from or landed at Idlewild during the period from an hour before, until several hours after, the time of the crash indicated that the weather was substantially as reported and that turbulence existed. This turbulence was variously described as from "light" to "severe" from the surface up to the 1,000-foot level. These pilot reports also indicate that all radio facilities at Idlewild were functioning normally during this period. In this connection all radio aids at the airport were checked by CAA as soon as possible; all were found to be operating normally.

The actual ceiling existing at the airport when the flight passed over was probably slightly below the carrier's 500-foot minimum. An observation started at 0817 was completed and transmitted to the control tower by telautograph at 0826. This was to be the Weather Bureau's 0828 sequence and included a 400-foot measured ceiling and a visibility of two miles. A careful study of the time factors involved indicates that it would not have been feasible, and perhaps not desirable, to relay this to the aircraft which was then (at 0826) approximately over the airport.

An examination of company flight records

[3] The flight manifest, showing gross weight out of Raleigh-Durham, was never recovered. It was to have been mailed from that point to the company at Miami. The flight manifest upon departure from Fort Lauderdale was properly filled out, and the one showing gross weight out of Charleston was executed and mailed.

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revealed that Captain Crockett had made five landings at, and four take-offs from, Idlewild during the six months preceding the accident. This examination also revealed that Copilot Woerderhoff had been on four flights landing at, and three flights taking off from, Idlewild during the previous six months.

Investigation of the wreckage and of the impact site disclosed that the aircraft was on a heading of approximately 330 degrees true, in a steep bank to the right, and nosed down nearly vertically when it struck. All wreckage was extremely localized, occupying a roughly rectangular area only about 142 feet by 30 feet. (A C-46 aircraft has a wingspread of 108 feet and an over-all length of 76 feet.) The left wing was found in a tree approximately 40 feet above the ground, while the empennage was at the base of that tree.

There was no indication found of any failure of the aircraft's structure prior to impact, despite the testimony of a number of lay witnesses who thought that they saw one or both wings fold backward. Investigation of the wreckage failed to reveal any indication of a fire prior to the crash, and this is borne out by the testimony of those few persons who saw the aircraft during its final few seconds of flight, in that none of them noted any trailing smoke or flame.

Careful examination of the wreckage also revealed that the landing gear and wing flaps were retracted at the time of impact.

All but four instruments were so badly damaged that their indications were meaningless.

These four were:

1. An altimeter which read 140 feet (the altitude of the impact site is approximately 150 feet).

2. An altimeter setting of 29.85 inches (the last barometric reading given the incoming flight was 29.82 inches).

3. Directional gyro upper scale, 218 degrees.

4. Radio compass No. I indicator, 10 degrees.

The positions of the tab trim indicators in the cockpit relative to their respective tab trim actuating jack shafts were studied. The indications varied considerably between cockpit indicators and jack shafts. There was some evidence that the aircraft at the time of impact was trimmed left wing down as if for flight with the right engine inoperative, but this is not conclusive because of the possible movement of the mechanisms at impact.

No evidence was found to indicate malfunctioning of the fuel system aft of the fire wall or of the hydraulic system prior to the crash. The fuel-selector valve settings were on "center tanks," with the cross-feed valve "closed." All six fire wall shut-off valves were open.

Maintenance records indicate that the aircraft at the time of the accident was being operated within the approved inspection and overhaul periods as listed in the company's maintenance manual, which is approved by the CAA. At the time of departure from Fort Lauderdale, Fla., on Apr. 5, 1952, the aircraft had been operated one hour and twenty minutes since its last No. 4 inspection (135 hours), and 119 hours since its last No. 5 inspection (270 hours). The subject aircraft was originally equipped with a Sperry A-3 automatic pilot. However, the carrier, not wishing to use the automatic pilot, had it deactivated.

This aircraft was equipped with Pratt & Whitney engines, Model R2800-7 and with Hamilton Standard propellers, Model 23E50-505. The right engine had a total time of 1,045 hours, of which 749 had been since it was last overhauled, and of which six hours and forty minutes had been since it was last inspected. The left engine had a total time of 997 hours, of which six hours and forty-five minutes had been since it was last overhauled. In the right engine there was no evidence found of structural failure or fire before impact following disassembly and thorough examination of all parts under the supervision of a Civil Aeronautical Board investigator.

The left engine was completely disassembled and its various components examined thoroughly. On this engine the diaphragms of both the fuel feed valve and the engine-driven fuel pump were found ruptured. The fuel feed valve diaphragm was not only ruptured but was stiffened as from age or from some unusual exposure. No other significant irregularity was found.

Subsequent ground tests made with a like model engine on a similar aircraft of the same carrier, and with the fuel feed valve diaphragm purposely damaged in simulation of the one in the crashed aircraft, demonstrated that:

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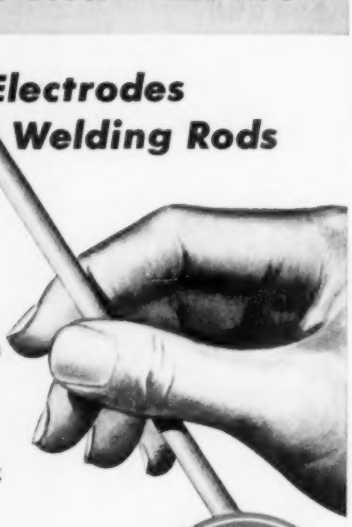

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of power ordinarily used during an approach).

(b) The engine would backfire violently, and stop completely if its throttle was advanced to the position of cruise power or more.

The left engine had only been in use for six hours and forty-five minutes since it was last overhauled. Investigation disclosed that this engine had been test-flown after installation in the aircraft for a period of 35 minutes by the chief pilot for U. S. Airlines and to his satisfaction.

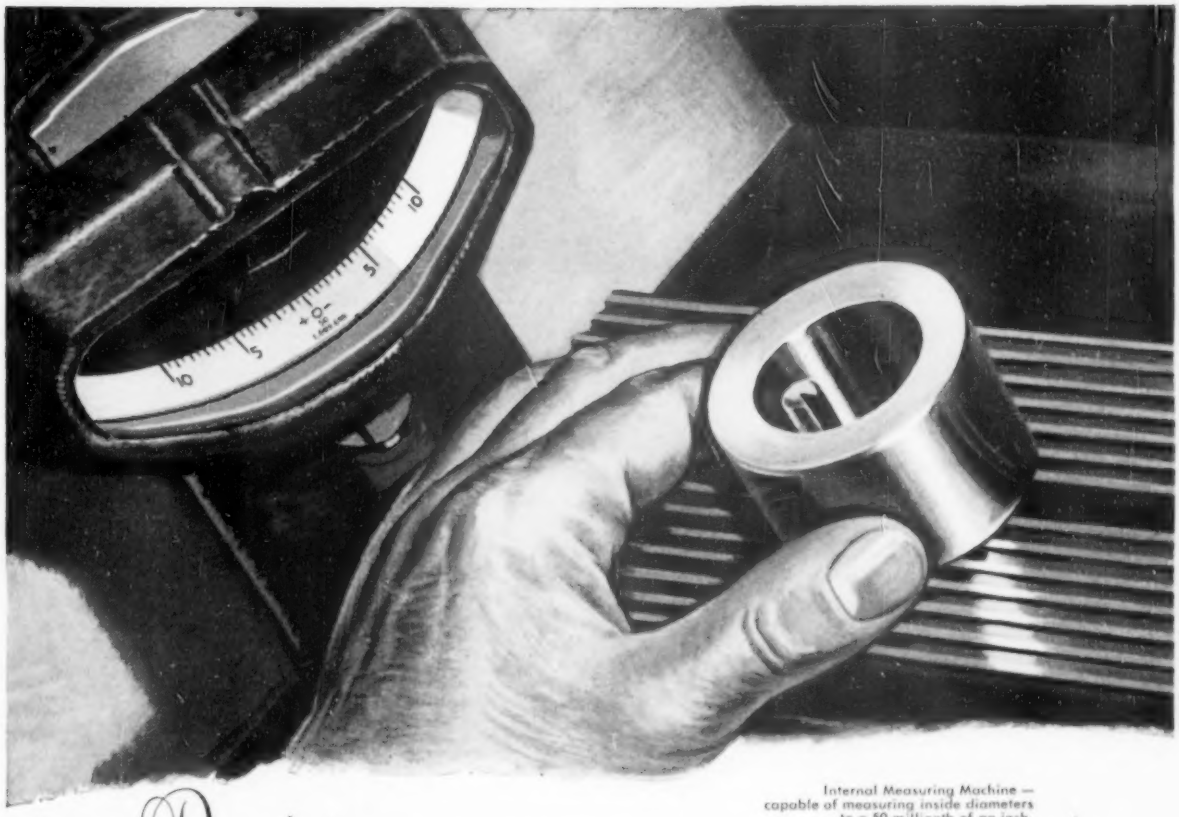
The propeller pitch setting of the left engine was determined to have been approximately 19 degrees at the time of impact. The right propeller was found to have been set at a pitch angle of 17 degrees at the time of impact.

Investigation further disclosed that the left engine had been overhauled for U. S. Airlines by the Air Carrier Engine Service, Miami, Fla. (ACES), a certificated engine ovehaul station. The diaphragm in question is an integral part of the engine and not of any accessory, and was supposedly installed by ACES at the time of engine overhaul. Replacement of this diaphragm is mandatory during engine overhauls, which for this carrier are required at periods of 905 hours or less of operation. Testimony of the mechanic employe of ACES who worked on that portion of the engine at the time of overhaul was to the effect that he could not remember replacing a new diaphragm on the subject engine, but that he had never failed to install new diaphragms on all engines that he had worked on. ACES shop procedure of overhauling engines calls for, first, a complete disassembly of the engine. All parts are then placed on a rack, and cleaned by immersion in "Kleen-A-Karb" (the trade name of a commonly used degreasing agent). Ferrous parts are then magnaflux-inspected, washed, placed on a rack, and sent to the inspection department. One inspector handles only the engine rear section (the section containing the defective diaphragm). An official of ACES testified that his company had never stocked diaphragms of the subject type and part number.

The diaphragm is some two inches in diameter and of fabric, coated with synthetic rubber. It is fastened to the engine intermediate rear case by a metal cover secured by six filuster head screws. This cover was permanently deformed (depressed) at all six screw holes as if the screws had been tightened excessively. The cover itself bore no signs of heat. Cover deformation of this nature could have contributed to, or possibly precipitated, failure of the diaphragm.

ACES received this engine on Jan. 4, 1952, for overhaul. Following the work the engine was block tested for five hours and ten minutes and pronounced finished on Feb. 7. No abnormalities were noted. The engine was then transported to the carrier's base on Mar. 25, 1952, and installed in N 1911M on Apr 4, 1952. In order to tamper with the diaphragm a metal plate, installed on the rear case for protection during transportation, would have had to have been removed.

Testimony of personnel of the carrier was to the effect that neither diaphragm nor



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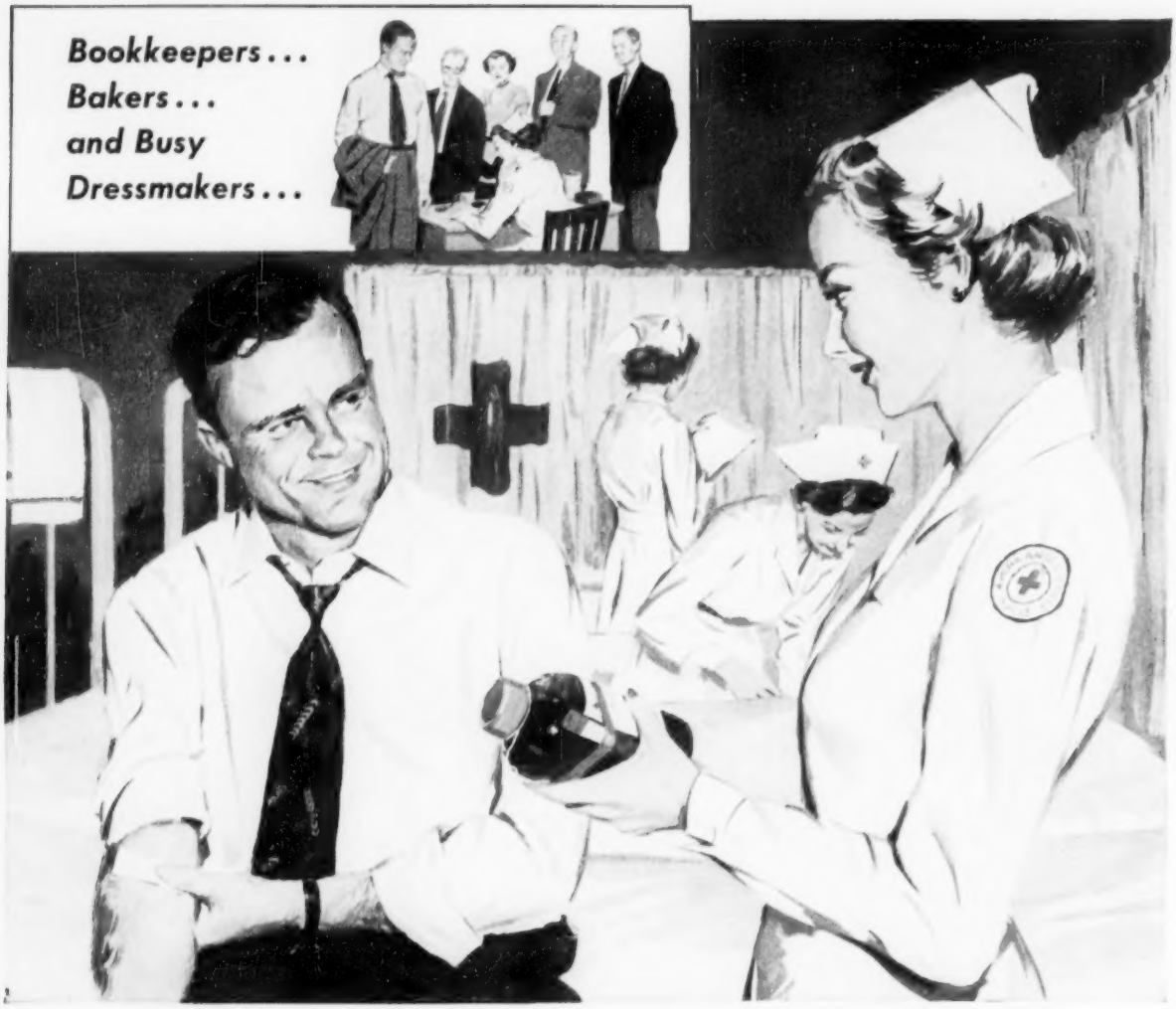

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cover was disturbed in any way after receipt of the engine from the overhaul base. The subject diaphragm and similar new diaphragms were forwarded to the National Bureau of Standards for tests; these will be discussed later.

ANALYSIS

When the flight reported "contact" over the outer marker, it meant that it had the ground in sight. It did not necessarily mean that it had any appreciable forward visibility. Because of rain and the fact that the aircraft was just about at the bottom of the overcast, or possibly in and out of a ragged bottom, it is probable that it had very little forward visibility. This must account for the flight not following the tower's first suggestion, "bear left and make a right turn into Runway 13L, that's the big runway on the north side of the airport, and call base leg coming up on the Federal Building. Go ahead and you'll probably be west of the Federal Building when you call." It appears that the captain, who was relatively unfamiliar with Idlewild Airport, which is much larger than most airports, and with the existing marginal weather, did not wish to lose the directional guidance of the NE leg of the Idlewild range which he unquestionably was using. Accordingly, he did not elect to follow the tower's suggestion but stayed on the range leg and maintained his 500-foot minimum until he was well up Runway No. 4.

After passing abeam of the tower, he was given a suggestion to turn left for an approach to the same Runway (13L). This was not acknowledged by the flight. However, almost immediately the tower asked if the left turn had been started, and the flight then did acknowledge by stating that it was pulling up for a missed approach.

At this time the left engine acted erratically with violent surging as the fuel feed valve diaphragm failed. This type of surging has an extremely adverse effect upon the aircraft's controllability. Control of the aircraft was then lost largely because of this surging, but also because of the turbulent air.

Although the right engine was developing power, the aircraft, under these conditions, lost altitude rapidly in what was probably an extreme right sideslip, taking on some of the aspects of a right spin, and crashed.

It is evident that no operational error was involved in this accident. Under the existing marginal weather at an airport the size of Idlewild, the tower operator acted properly, and in full discharge of his duties, in twice giving detailed landing suggestions.

The captain likewise cannot be criticized for not following this advice but it would have been better practice for the flight to inform the tower if it did not intend to follow such advice. He was flying at his company's legal minimum altitude and all evidence indicates that horizontal visibility at that altitude was highly restricted. Accordingly, to have let down further would have been in violation of these minimums.

Failure of the engine-driven fuel pump diaphragm would not be expected in any way to fail the fuel feed valve diaphragm. However, failure of the fuel feed valve diaphragm might possibly cause pressure

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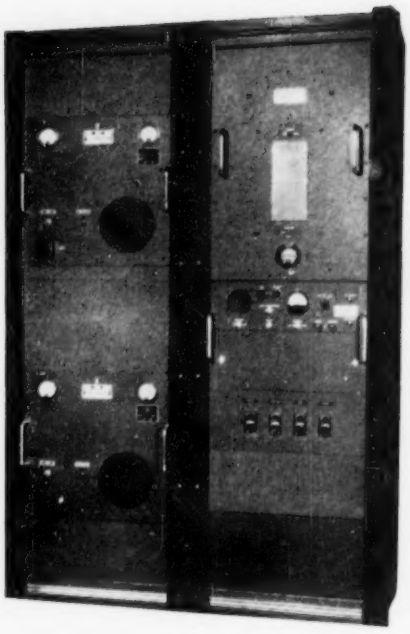

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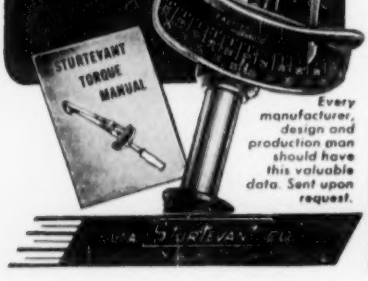

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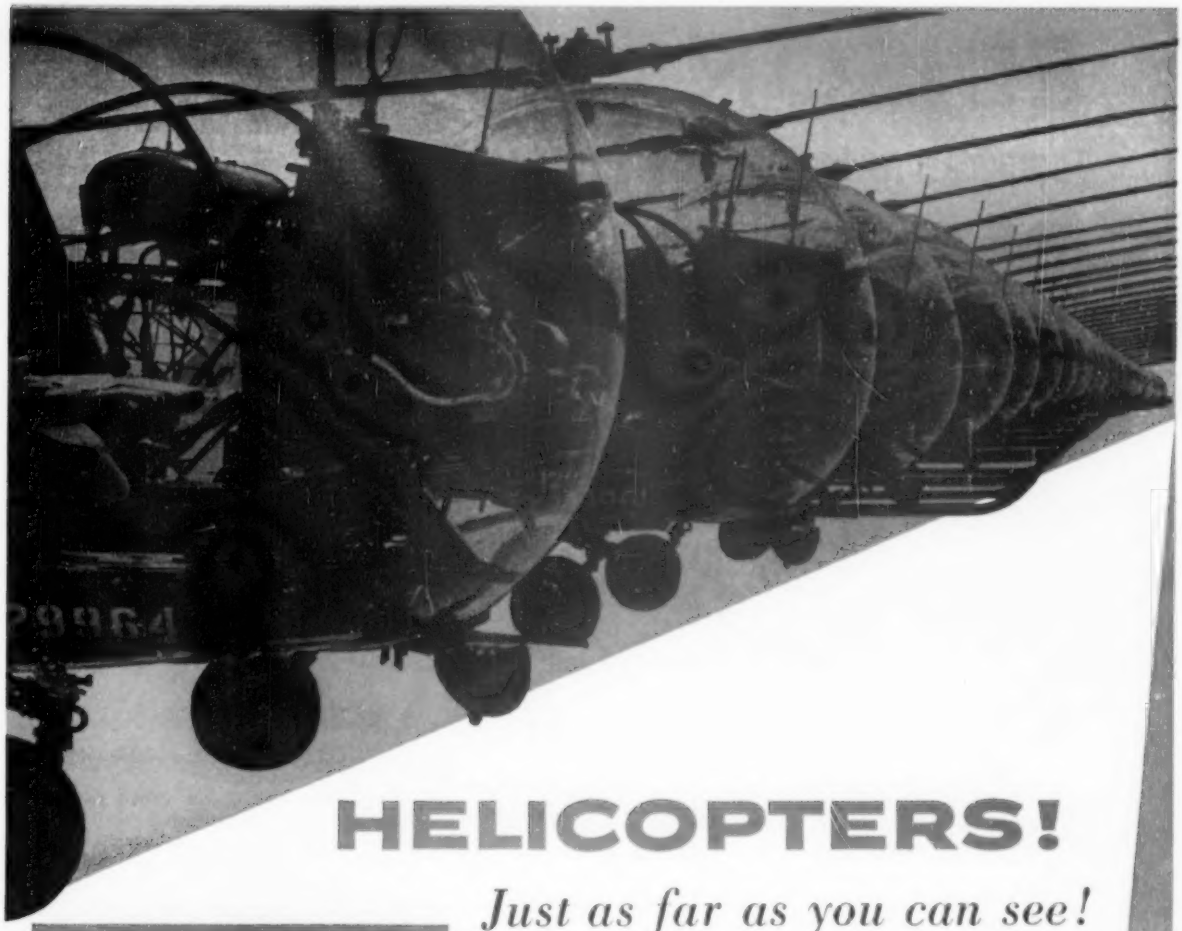
surges at the fuel pump outlet resulting in failure of the fuel pump diaphragm. It is more likely, however, that this failure was the result of a pressure surge which occurred in the fuel line at impact. The condition of the fuel feed valve diaphragm, as found, could not have resulted from heat of the ground fire following impact because its location insulates it quite well from heat.

There is conflict in the testimony as to the responsibility for the installation of the defective diaphragm and its deformed retaining cover in this overhauled engine. Either the diaphragm was not replaced by ACES at the time of overhaul, or U. S. Airlines, Inc. replaced it after receipt of the overhauled engine. Although the second possibility does exist, we regard it as a very remote one, in light of tests conducted by the U. S. Bureau of Standards and of other factors brought out in the record of this case.

As indicated above, the defective diaphragm together with new diaphragms of the same type, were forwarded to the U. S. Bureau of Standards for an examination of the defective diaphragm itself, and for them to attempt to reproduce in the new diaphragms the same stiff and otherwise deteriorated condition as that existing in the failed diaphragm. The tests conducted by the Bureau of Standards disclosed that a new diaphragm, even if immersed in aviation fuel for a period as long as 1,000 hours, would *not* deteriorate or become stiff as had the failed diaphragm found in the left engine. The tests further disclosed, on the other hand, that a new diaphragm if immersed in aviation fuel for 1,000 hours and then in "Kleen-A-Karb" for four hours *would* stiffen and deteriorate to a condition substantially the same as that of the failed diaphragm. These tests indicated, in other words, that to produce a stiffened and deteriorated condition such as that found in the defective diaphragm, mere use in an engine and contact with aviation fuel was not enough.

The investigation conducted by the Board's investigators revealed no evidence that the engine as received from ACES had been tampered with in the shops of U. S. Airlines. Furthermore, no evidence was found indicating that a part or all of a fuel feed valve assembly had been installed in any other aircraft of U. S. Airlines in the time during which U. S. Airlines had the engine in its shops. Furthermore, since U. S. Airlines does none of its own engine overhauls, it does not have a degreasing agent similar in strength to Kleen-A-Karb. Finally, there is the testimony of record of the principal officials of U. S. Airlines indicating under oath that the engine as received from ACES was not tampered with in any way prior to its installation on the aircraft, N 1911M. These factors indicate to us that the replacing by U. S. Airlines of the diaphragm after receipt of the overhauled engine from ACES is a very remote possibility.

The Bureau of Standards' tests indicate, on the contrary, that the first possibility—that the diaphragm was not replaced by ACES at the time of overhaul—is the probable explanation for the presence of the defective diaphragm in the left engine at the time of the crash. ACES was responsible



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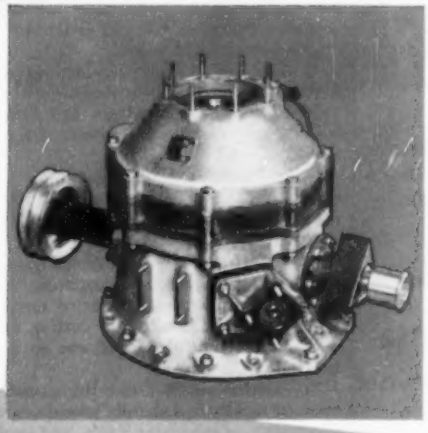

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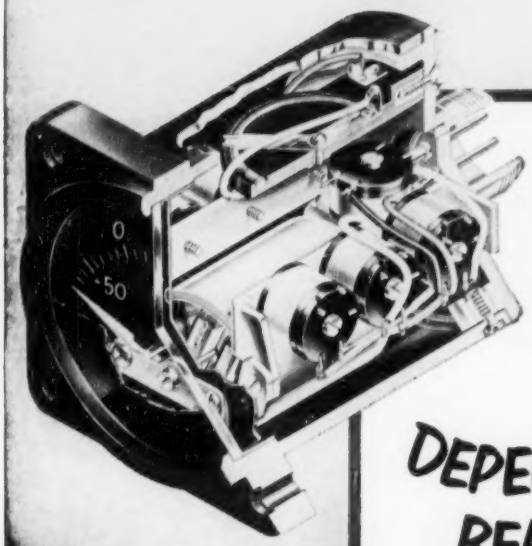

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Cutaway illustration showing the construction of a small, single dial Edison Temperature Indicator—one of four Edison Temperature Indicators chosen for the new Model 1049 Constellation. Here . . . again . . . Edison instruments were the choice because of these five exclusive features.

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for the installation of a new diaphragm in connection with its overhauling of the engine. Personnel of ACES testified that the company had never stocked diaphragms of the subject type and part number. As already noted, the Bureau of Standards' tests indicated that an immersion of a similar new diaphragm in aviation fuel for 1,000 hours and then in Kleen-A-Karb solution, which was the agent stocked and used by ACES, would deteriorate a new diaphragm to a condition substantially the same as that of the failed diaphragm in question.

As the time for overhauls for the subject engine was 905 hours, it must be concluded that the diaphragm in question had been in use, i.e., exposed to fuel for this period of time, had not been removed, was immersed in a cleaning agent, and put back in the overhauled engine.

Although ACES company officials testified that such omission could not possibly happen because of their shop methods, the Board finds that the diaphragm in question was not replaced at the time of engine overhaul, and that its deteriorated condition as found was due to its having been subjected to previous service and to the action of the "Kleen-A-Karb" agent. It is quite obvious that had a new diaphragm been installed, its condition could not have been reduced to the state of the one involved during six odd hours of engine use.

FINDINGS

On the basis of all available evidence, the Board finds that:

1. The carrier, the aircraft and the crew were properly certificated.
2. The flight was properly dispatched and cleared and was routine until it arrived over Idlewild Airport.
3. As the flight approached Idlewild it was given the local weather including a measured ceiling of 500 feet and a visibility of one and one-half miles.
4. This ceiling and visibility were the minimums for the subject flight.
5. The captain elected not to follow the tower's suggestions due to limited forward visibility at his altitude.
6. During power application for a missed approach the fuel feed valve diaphragm of the left engine either completely failed or an existing failure became worse; this diaphragm had not been replaced at the time of engine overhaul, as required.
7. The left engine then acted erratically with surging, intermittently cutting out.
8. At the time the flight was on instruments in turbulent air.
9. Control was lost and the aircraft descended rapidly in a sharply nose-down right slip taking on aspects of a spin, and crashed.

PROBABLE CAUSE

The Board determines that the probable cause of this accident was loss of control following sudden engine failure, caused by a deteriorated fuel feed valve diaphragm during an attempted missed approach.

BY THE CIVIL AERONAUTICS BOARD:

/s/ DONALD W. NYROP
/s/ OSWALD RYAN
/s/ JOSH LEE
/s/ JOSEPH P. ADAMS
/s/ CHAN GURNEY

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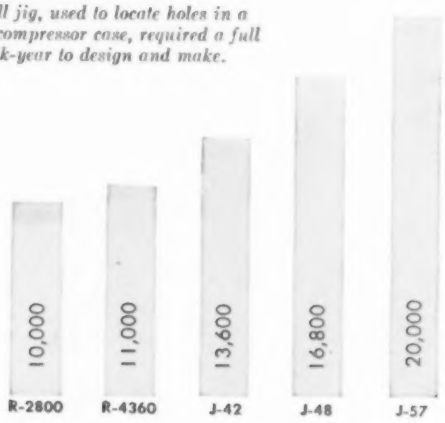

This chart illustrates the drastic increase in tooling requirements from piston engines, to early jets, to the mighty axial flow jet, the J-57. Production tooling is, of course, only one of the complex phases of building jet engines. But the relationships illustrated here are typical of all phases of design, development and production.

Everyone concerned with aircraft production knows that a modern military airplane is more complex than its World War II counterpart.

But how many, we wonder, realize *how much* more complex it is?

For instance, take the engine, the heart of any aircraft. As just one measure of how problems have increased in powerplant development, we show above the number of *special* tools, jigs, dies and fixtures required to produce various Pratt & Whitney engines to the point at which they passed their 150-hour type tests.

Each of these tools had to be designed and made—*and made to work*—before the engine in question could itself be manufactured. There were 10,000 such special tools required for the R-2800, one of the most powerful piston engines of World War II. Today, 20,000—just twice as many—are required for the J-57 Turbo-Wasp!

While tooling is only a single phase of jet engine production, it illustrates the complexity of the entire industry's problem. It also helps demonstrate why—today as always—*dependable engines take time to build.*

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CAB Holds Key to Future Airline Profits

- **Carriers earned nearly $55 million last year.**
- **But rate probe may set future profit margins.**

By Lee Moore

Future profits of the airline industry are at stake in two regulatory proceedings now moving into high gear at Civil Aeronautics Board:

• **General Fares Investigation.** CAB decision on passenger fares may affect vitally the profit margins of the domestic airlines. Counsel for the CAB Bureau of Air Operations has set a Jan. 15 deadline for airline reports on their anticipated revenue and expense, break-even load factors, and other data important to pricing of future passenger transportation service. Passenger fares are the major profit factor for domestic trunklines because they no longer depend on mail subsidy.

• **Trans-Atlantic Mail Rate Case.** CAB decision will fix final past and future mail rates for Pan American Airways Atlantic Division and Trans World Airlines international routes. Subsidy mail rates will remain the profit governor on international operations for some years to come. But the setting of a final rate will put the airlines on their own, to profit or lose by their own efforts with no recourse to retroactive changes.

Meanwhile, the combined major domestic and international airlines probably will report 1952 earnings near $55 million, about the same as 1951, financial observers predict. This is about a 9% return on invested capital.

Here is what AVIATION WEEK found through interviews with key CAB staff members about the current rate-making policy which will bear on both the domestic fare investigation and Trans-Atlantic Mail Rate Case.

▶ **Argue Proper Profit Return**—The basic controversy between airlines and CAB rate-makers will be whether today's domestic fares and international temporary mail rates are "fair and reasonable," too high, or too low.

Airlines argue that today's airline business profits are temporarily inflated by boom conditions and equipment shortage—and still aren't high enough. They say rates should be adequate to:

• **Buy new planes** without increasing debt burden substantially. Debts are now about one-third of invested capital for the trunklines, a CAB official says.

• **Cushion future declines** in profit margins, inevitable because of increasing competition, falling load factors and fluctuations which occur in general business.

• **Offset past losses** of the 1946-49 airline depression. Threading through all three of those arguments is the investors' plea for relief from uncertainty in airline financing under past CAB rate-making policies—mainly violent fluctuations in earnings and dividend payments.

On the other hand, counsel for the Bureau of Air Operations, representing the public, can be expected to make these counter-arguments:

• **Airlines are financing** new equipment fairly smoothly so far, despite the gigantic size of their planned investment.

• **Low fares,** or low sales profit margins, broaden the market and may be better for long-run profits than increasing fares in a boom and helping create a bust. Also, CAB and the airlines have a responsibility to bring the lowest reasonable fares to the public. Airlines must accept this regulatory policy in exchange for Board protection of their quasi-monopolistic route franchises, granted "in the public interest."

• **CAB did not guarantee** profits to air-

Airlines' 1952 Return on Investment As Calculated by CAB Rates Division For 12 Months Ended Sept. 30

	Net Profit* (millions)	Return on Investment**
American	$10,723	10.0%
Eastern	5,400	7.6
TWA	7,757	8.3
United	10,064	10.6
"Big Four" Average* **		**9.3**
Braniff	287	2.2
Capital	1,267	10.5
C & S	1,237	15.3
Delta	2,089	18.8
National	1,920	14.0
Northwest	1,282	3.8
Western	1,130	11.3
"Middle Seven" Average* **		**9.1**
Colonial	(– 516)	....
Continental	275	7.5
Northeast	(– 270)	....
"Little Three" Average		....
15 Trunklines' Average** **		**8.9**
Panagra	(– 49)	....
Pan American	6,492	5.0

Source: CAB Rates Division computations from Form 41 reports.

* Profits after taxes and interest payments. (For rate-making purposes, however, CAB figures profits before interest payments.) These profits exclude revenue from "non-transport" sources.

** Investment allowed by CAB for rate-making is for "direct transport" operations only. It excludes such investments as those in foreign subsidiaries, deposits paid on equipment not yet put in operation, and other "non-transport" investment.

*** Average is figured as total profit divided by total investment of the group, not an average of individual return percentages.

**** Braniff and Mid-Continent figures consolidated because of merger during year.

Airlines' Return on Investment In Transport Operations*

(12 months to Sept. 30, 1952)

Trunklines' domestic routes only:	
Net profit	$47,659,000
Invested capital	$414,894,000
Return	11.5%
Trunklines' international routes:	
Net profit (loss)	(−$5,014,000)
Invested capital	$67,866,000
Return (loss)	−7.4%
Pan American and Panagra:	
Net profit	$6,443,000
Invested capital	$143,932,000
Return	4.4%

Source: CAB Rates Division computations from airlines' Form 41 reports.

*For rate-making purposes, CAB counts revenues and investment of direct transport operations only—excludes foreign subsidiaries, advances on equipment not yet delivered, and other non-transport finances (such as hotel investments and revenues).

lines, and hence needs not set future rates to give earnings adequate to make up past losses. Rates officials claim airline management itself helped create the 1946-49 airline depression.

And as to the generally poor reputation of airline investments, the CAB officials point out that dividend policy is a company problem—whether to put cash profit into expansion of equity value or pay it out immediately. Capital gains of major airline market values have been fair enough over the long run, some CAB people say. The violent fluctuations of airline equities after the war have been due partly to early over-optimism, over-expansion and the technological revolution in the industry—as well as CAB regulation.

This summarizes the general policy debate to be expected in the General Fares Investigation and Trans-Atlantic Mail Rate Case resuming this month.

Rate-Making Policy

Here are more detailed explanations of CAB rate-making policy with regard to each case—a summary of comments gathered in interviews with Gordon Bain, director of the Bureau of Air Operations; Irving Roth, chief of the Rates Division; Lou Sissman, chief of the Commercial Rate Section and Harry Schneider, chief of the Mail Rates Section.

► **Passenger Fares**—The trunk airlines are now nonsubsidized, so fares are the major guide to their profits. This is a little realized transformation in the domestic airlines' position. The airlines are on their own now, with the exception that regulation of fares continues.

Eastern Air Lines is cited by a Rates official as an example of what a CAB-regulated airline off subsidy can do. Eastern earned money each year since its start. CAB does not regulate Eastern's fares singly, but those of the industry as a whole. Therefore, Eastern, as one of the most efficient, can prosper according to its efficiency in relation to the industry as a whole.

CAB will strive for an industry-wide fare level that will allow all 14 trunklines to get off subsidy if they have "honest, efficient and economical management." At the same time, through its control of new route and merger applications, CAB will continue to strive for a balanced route structure to stabilize profit returns or margins.

The current General Fares Investigation may show that the present fare structure is "about right," or it may lead to changes. On this score, Rates officials cite several "misconceptions" held by some Wall Street financiers and some airline circles on CAB fare level policy:

• **Holding fares down.** Exactly one year ago, airlines asked for a $1 fare increase on all tickets and elimination of the 5% roundtrip discount. They forecast financial difficulties if these requests were not granted. CAB allowed the fare increase but not the discount elimination. Airlines made as much money in 1952 as in the record year 1951, and they withdrew their request for elimination of the roundtrip discount.

CAB says it has no intention of cutting airline earnings to the bone. When net profits drop from 20% to 15%, the Board figures there is no cause for alarm unless profits promise to continue decreasing to below 7-10%. But the public cannot be expected to foot the bill for excess profits, CAB says, so the Board is now looking into the fare levels.

As to the huge cost of introducing new-type planes, Board officials say they believe 1952 annual reports will show that selling old equipment tends to offset extraordinary costs of introducing the new. Despite a succession of non-recurrent losses the first half of this year (Newark crashes, airport closing, and gas rationing), earnings will equal a year ago, although this year was a new-fleet year.

• **Fares declining now.** The Investment Bankers Assn. aviation securities report (AVIATION WEEK Dec. 29, p. 38) said, "Rates have declined in the face of mounting costs for materials and labor and heavier tax burdens." But this is not so, CAB officials contend.

Airlines got their dollar fare increase. The coach fares are the same as before, but coach service is growing rapidly. This causes the "yield" of revenue per passenger-mile to decline, but since there are 25-50% more passengers per plane, the revenue per flight—the return on investment—is equal or better, they point out. Further, airfreight and express rates went up, not down, in 1952.

• **Poor financing record.** CAB Rates officials say that recent financing by TWA, Delta and Pioneer was considered successful. The United issue went sour after initial flotation, due to overpricing and increasing interest rates.

In the Trans-Atlantic Mail Rate hearings over the Christmas holidays, TWA pointed out that airline securities did not keep pace with the general averages in 1952. Rates officials claim this was due largely to the airlines giving extremely wide publicity early this year to predictions of plunging earnings unless fares were substantially increased.

Financial Outlook

Air transport finances should show an improvement as investors become aware of its new position as a grownup industry, CAB Rates officials say.

• **1953 forecast.** There is talk of financial troubles to come, but CAB finds the 1953 outlook quite fair—assuming no catastrophes.

Here is the bright side of 1953 as seen by CAB Rates officials:

• New aircraft bring more efficiency, cut costs.

• Management ability and technique is catching up with the growth of its industry.

• Costs are leveling out, and cost per revenue ton-mile this summer dropped below a year ago for some airlines.

• Revenues continue to climb, with the Air Transport Assn. forecasting a 10 to 14% increase of passenger revenue in 1953.

• Coach business is booming, with no end in sight.

Utilization and load factors probably

will decline in 1953, because airlines are buying more equipment than they absolutely need. This will lower load factors but will render better service to the public, thereby improving their long-term reputation and investment position.

• **Inadequate profit margin.** The trunklines' pretax profit margin of 14% on sales compares with 2% for aircraft manufacturers, CAB Rates officials note.

• **Controlled profits.** Airlines are alarmed by CAB's pressing the "general fares investigation" at this time. One spokesman for a major trunkline described the probe as an effort by the Board to control airline profits to set fares, now that withdrawal of subsidies to carriers has deprived CAB of profit control through setting of mail rates.

CAB officials point out that airlines generally fought for lower fares to expand business when they were on subsidy with the government taking the loss. CAB then was forced to step in from time to time to keep rates high enough to avoid undue subsidy cost.

Now the shoe is on the other foot. When there is a threat of rising costs, the airlines must find more revenue themselves. They naturally look to higher fares as one way to get more money. CAB must regulate fares low enough to pass on savings to taxpayers who paid for trunklines' growth through subsidy up to a couple of years ago.

The route franchise granted airlines by CAB restricts entry of business competition, so the Board also has the responsibility of preventing profiteering (exorbitant profit returns on investment) on that franchise.

CAB protection of airlines from route competition in effect is a method of keeping rates up at the same time the Board regulates fares to keep them from going too high, Rates officials concluded.

▶ **Atlantic Final Mail Rate**—International operations still depend on subsidy, and CAB decision on mail rates is a vital profit factor. Hearings on the trans-Atlantic final mail rate case reconvene Jan. 26. Counsel for the Bureau of Air Operations will present exhibits then, having heard testimony of TWA and Pan American already.

In this case, CAB will fix final rates for the period from 1946 to date, as well as final present and future rates. TWA and Pan American currently are operating on rates set temporarily by CAB at estimated "break-even"—not enough to pay profits. Thus, if the break-even estimate proves nearly correct, the final rate will be higher.

Temporary present rates are:

• **TWA.** Annual rate estimated to yield about $3,268,000.

• **Pan American.** Annual rate estimated to pay $12,270,000.

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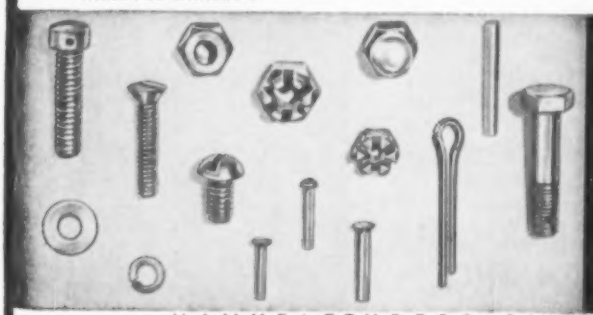

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temporary rates are Pan American's Latin America Division, Braniff, and Northwest International. Already operating in final mail rates are Pan American's Pacific Division, Panagra, and Chicago & Southern.

► **CAB Policy**—Here is the CAB rate-making policy on final subsidy mail rates:

First, CAB estimates future revenue and expense. Then the Board sets a subsidy mail rate estimated to yield enough overall profit to the airline to give it a fair return on investment. Once a rate is set, it's up to the carrier to "beat" the fixed scale.

The CAB staff is proud of its progress toward its goal of placing all major airlines on final rates. CAB believes the finality of the rate will prove a great incentive to the airlines to cut waste and luxury. When they were on temporary rates, incentive was lacking because of the possibility of adjustment. Whatever the airline makes on the final rate, it keeps. There is no retroactive increase or decrease in the rate.

When that final mail rate is set, CAB Rates officials sit back and wait at least a year to watch profit returns. Even if a company makes a 20% return in the first year, CAB may not "reopen" the rate if there are signs that profit return will not continue. Until CAB reopens the rate, all gains or losses are permanent.

If a company finally shows signs of definitely making excess or inadequate profits, CAB or the airline itself may reopen the rate. When a new rate is fixed, it applies from the date of reopening forward. The final rate is not subject to retroactive adjustment.

Estimating an airline's future revenue expense in the final mail-rate hearings is the vital aspect of the case. Once CAB and airlines can come close to agreeing on revenue forecasts, the rest usually is comparatively simple. When it comes to the question of how high profits should be, the CAB rate-makers do not appear ready to change their historic concept of around 8% during a long period—perhaps slightly higher in the present boom times.

When the trans-Atlantic mail rate is fixed, CAB staffers anticipate investors will find a much-improved situation in appraising the outlook for TWA and Pan American earnings. They will be more like a non-regulated company, because retroactive changes in mail rates will not threaten the value of the investment.

Urges Airports Near Noisy Areas

One of the solutions to the transport plane noise problem is to locate air terminals in noisy industrial districts, thus making aircraft sounds less noticeable, says sound engineer Dr. Howard C. Hardy, assistant chairman, physics department, Armour Research Foundation of Illinois Institute of Technology.

Dr. Hardy thinks there is little hope of eliminating the noise nuisance by redesigning aircraft, engines or propellers.

He considered these the major problems:

- A four-engine plane taking off makes conversation difficult anywhere within two miles of the line of flight.
- The width of the area covered by disturbing noise is two miles from each side of the flight path up to about 10 miles from the airport. A four-jet transport would double this swath and would be annoying within two miles of the field.

Hardy advises against building a home within two miles of the runway flight pattern.

AA EXPANDS CHICAGO FACILITIES

American Airlines' new passenger waiting room at Chicago Midway Airport has separate ticket and baggage counters. Lobby space has been tripled. The carrier's expansion program at the field includes a 684-ft. heated passenger concourse capable of handling six DC-6 transports simultaneously, and a new cargo transfer center. The $356,000 program was handled by Inland Construction Co.

C&S-Delta Merger Gets Final Approval

Civil Aeronautics Board and President Truman have approved merger of Delta and Chicago & Southern, as predicted in AVIATION WEEK (Dec. 29, p. 48). Oral arguments before CAB were held Dec. 11.

CAB did not impose new route restrictions on the combined system.

Delta president C. E. Woolman becomes president and general manager of the new company. C&S chairman Carleton Putnam becomes chairman of the board. Name of the new carrier will be Delta-C&S Airlines.

C&S president Sidney A. Stewart will be executive vice president, and three C&S directors join the Delta board. Headquarters of the organization is at Atlanta.

► **Mail Pay**—The combined line will be the sixth biggest domestic in terms of route-miles—9,508, including the 2,820 mi. of Caribbean and Latin American routes of C&S.

The merged company will receive a subsidy of 53 cents a ton-mile for mail pay, except for the subsidized international division. CAB estimates the merger will provide expense savings of about $250,000 a year, although the two companies claimed savings would be near $1 million.

Combined fleet includes 7 DC-6s, 6 Constellations, 5 DC-4s, 29 DC-3s and 3 C-47s, plus 20 Convair-Liners and 4 DC-7s on order.

Labor protection provisions written into the merger by CAB give displacement and dismissal allowances, and travel and moving expenses, including real estate adjustments.

Delta reported a 12% gain in passenger business in 1952, and estimates net 1952 profit of $4,147,079 after taxes, double 1951's figure—$1,947,225.

Chicago & Southern estimates its 1952 profit was higher than 1951's $1,130,959, with revenues up 21% to more than $15 million.

Airliner-Lightplane Crash Hearing Held

A Civil Aeronautics Board accident hearing was held last week at Richmond, Ind., on the Lake Central DC-3 collision with a four-place Cessna there last month. Sherman Graves, general manager of the Cessna Aircraft Helicopter Division, who was flying the lightplane, was killed.

The planes hit a few feet in the air at the uncontrolled airport while landing in different directions under icy windshield conditions. CAA and Air Line Pilots Assn. officials, meanwhile, are trying to develop a better system to minimize the dangers of in-flight collisions at uncontrolled airports.

One such proposal is that an airline ground official hoist a flag to warn airline pilots when other aircraft are in the area. Another is designation of VHF frequencies for plane-to-plane self-control at airports lacking tower communications facilities.

JAL Plans Flights To San Francisco

Japan Air Lines, expecting a government franchise soon for operation on international routes, plans to initiate twice-weekly DC-6 service Tokyo-San Francisco in April or May.

The Japanese government already has loaned JAL about $5.5 million and is hoping for World Bank aid to support future needs of the carrier.

The Japanese embassy is negotiating in Washington for permission to route trans-Pacific flights to San Francisco and official U. S. consent is expected.

The airline is to be manned wholly by Japanese, who gradually will replace American pilots supplied by nonsked Transocean Air Lines. Of 2,000 Japanese transport pilots screened, JAL has picked 40 former DC-3 pilots and is training them at the airline's home base and at Transocean facilities in Oakland, Calif.

► **Expansion Program**—Japan Air Lines is completing purchase of two DC-6s in this country for the San Francisco service. The carrier now operates six

ALPA EXECUTIVE

Sterling W. Camden, Jr., Eastern Air Lines captain based in New York City, is new executive vice president of Air Line Pilots Assn. Active in ALPA many years, Capt. Camden has served as council chairman, chairman of the Master Executive Council, chairman of negotiating committees and as a member of various other committees. He assumed his new duties last week.

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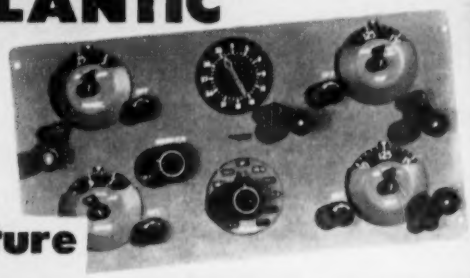

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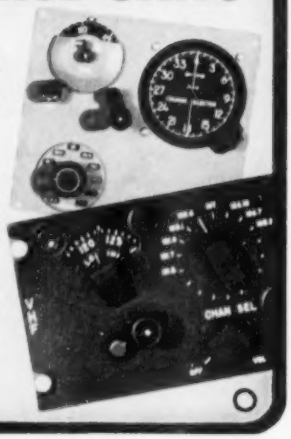

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DC-4s on domestic trunk routes. JAL operates no feeder flights, but three Beech twin-engine planes now used for training may be converted to night mail delivery in Japan.

The carrier's expansion plans also include purchase of seven more DC-6Bs and two Comet IIs within a period of three years.

With the start of flights to San Francisco, JAL expects to take DC-4s off routes in Japan and begin twice-weekly service to Okinawa. Similar flights may be routed to Bangkok, Thailand, via Hong Kong, by fall of next year.

JAL officials say they hope to begin their flights to Manila in the very near future.

The airline plans eventually to extend its flights to include world-wide routes—flying from San Francisco to Sao Paulo, Brazil, via Mexico City, and Lima, Peru, and extending the Bangkok flight to Karachi, India.

► **Japan-Owned**—Ryohei Itow, JAL general manager, says American influence in the carrier is being reduced in an effort to identify it as a Japan-owned-and-operated enterprise. U. S. interests own a very small fraction of the total JAL stocks, he says, and these are "virtually courtesy shares."

Close cooperation with American carriers will be required in maintenance of the airline's planes, however. Repair and operational checks are scheduled to be done by a service organization which is jointly owned by JAL, Pan American World Airways and Northwest Airlines.

Itow gives the impression that his airline is the carrier chosen by the Japanese government for operation of trans-Pacific service, with Japan International World Airways operating major westbound routes.

New Airline Terminal For New York City

New York's new $7-million East Side Airlines Terminal—jointly owned by 10 U. S. carriers—is scheduled for completion in the midtown area by next August.

Paul H. Brattain, president of the Terminal Corp., says the terminal will be the "largest and most modern facility of its type in the world." It will serve as New York headquarters for 21 U. S. and foreign scheduled airlines.

The corporation recently signed two leases with Carey Transportation, Inc., giving the operator of airport bus routes in the New York area 51,000 sq. ft. in the terminal's lower garage area for storage and maintenance of 90 vehicles and an additional 80,000 sq. ft. of parking space designed to accommodate 350 cars.

Aviation Safety

Near-Crash Reports Vital, Sayen Says

Criticism of Civil Aeronautics Administration and airline actions tending to defeat the practice of reporting near-accidents was voiced last week by Clarence N. Sayen, president of Air Line Pilots Assn. (AFL).

Asserting that a primary safety function of the pilot is to discover and report air-safety problems, Sayen said anything that interrupts or interferes with the free flow of this information is in itself a hazard.

The ALPA president said two administration and carrier actions "almost completely shut off incident reporting on some airlines and drastically reduced it throughout the industry creating a hazard of greater magnitude than that which they (CAA and the airlines) were at the moment trying to eliminate."

▶ **The Near-Misses**—The incidents Sayen cited were:

• **A day or two** after the collision in 1949 of a P-38 flown by a Bolivian pilot with an Eastern Air Lines DC-4 at Washington National Airport, an EAL Constellation was climbing out of the same airport under air traffic clearance. The airliner made a turn to the right and was still climbing when it narrowly averted a collision with an Air Force plane.

The military plane, a B-25, was flying with the hood up in a simulated instrument approach at a steep rate of descent. The airline pilot executed a quick evasive manuever, preventing the collision. The crew of the military plane apparently at no time saw the Constellation. The Eastern captain reported the incident to the Washington tower, and steps were taken, curtailing military training flights in the congested area.

However, Sayen says, the crew of the airliner heard nothing further until six months later when the captain and co-pilot received "greetings" from the CAA Enforcement Division, informing them the administrator was seeking to have their licenses revoked. It seemed someone had computed that the airline aircraft may have been on a collision course under a rule book interpretation of Civil Air Regulations. The crew spent many months in expensive litigation trying to clear their pilot records of charges that never would have been brought if the Eastern captain never had reported the incident.

• **The other incident** involved a pilot and co-pilot ferrying an empty DC-6 airliner. A training approach to a landing was made, with the co-pilot at the controls. The approach was high, and the pilot considered going around for another landing. But difficulty was experienced first in a reversing of the propellers and then in bringing one of the propellers back to positive pitch from reversal. The go-around was abandoned. The crew stopped the DC-6 on the runway, taxied it to a ramp and reported the propeller difficulty to maintenance.

The airplane had been needed at the station to replace a disabled transport. When pilot grounded the replacement DC-6 because of the propeller difficulties, he was removed from flight duty, Sayen reported. Several days later the pilot was discharged, although he had been with the company more than 10 years and "was regarded as a competent pilot."

Sayen said the pilot reporting propeller reversal still would be employed had he remained silent. The DC-6 captain still is involved in an expensive procedure trying to clear his record, the ALPA president said.

"Reaction among the airline's pilots was so violent that all co-pilot training, including takeoffs and landings by co-pilots, was suspended immediately by official action of the pilot representatives," Sayen said, "and serious consideration was given to suspending all incident reporting, including log books." (Legally, the pilots would be justified in reporting only that an aircraft was not airworthy, without specifying why.) Had this occurred, the airline would have been paralyzed in a matter of days for lack of information concerning state of aircraft and facilities.

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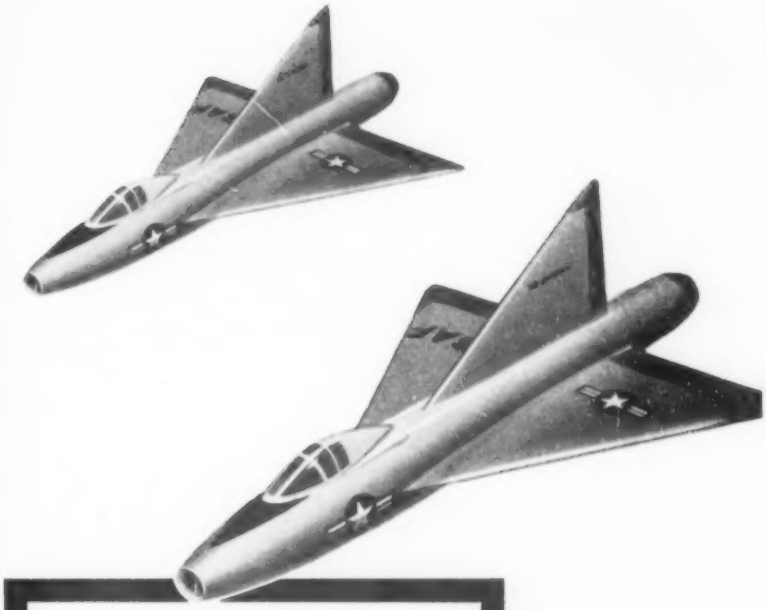

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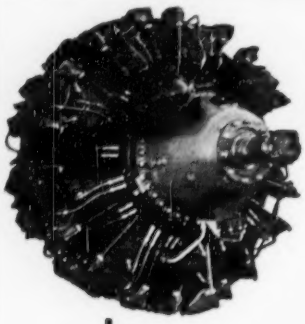

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71	828TY13Z2	Weston	Oil Temp Indicator
40	119862	Weston	Carb. Air Temp Indicator
10	15401-1	Eclipse	Amplifier (PB10)w/ED3 MOUNT
66	10078-1AG	Eclipse	Gyro Indicator
69	CQ-9	Eclipse	Clutch Switch (PB10)
57	MF45-3911-20Z	Vickers	Hydraulic Pump (3000PSI)
327	PF4-713-20BCE	Vickers	Hydraulic Pump
75	1416-12E	Eclipse	Starter
142	28006	Airesearch	Jack (Cowl FLAP)
45	AN4103-2	Clifford	Brass (Valve #U4785) Oil Cooler
120	MF9-713-15A	Vickers	Hydraulic Pump
550	TFD 8600	Thompson	Fuel Booster Pump
125	D7818	Adel	Anti-Icer Pump
250	AN4014	Erie Meter	Wobble (D-3) Pump
1000	AN5780-2	G.E.	Wheel & Flap Position Indicator
400	AN5780-2	Weston	Wheel & Flap Position Indicator
115	P4CA2A	Parker	Primer
70	AN3213-1	Scintilla	Ignition Switch
458	A-9 (94-32226)	Nasco	Ignition Switch
90	JH950-R	Jack & Heinz	Starter Motor
53	AN6203-3	Bendix	Accumulator 10"-1500 P.S.I.
140	K14949E	Marquette	Windshield Wiper Kit
188	EYLC-2334	Barber-Colman	Control
11	12086-1C	Eclipse	Amplifier
250	558-1A	Eclipse	Oil Separator
100	716-3A	Eclipse	Generator (NEA-3A)
89	318	Edwards	Horn
230	921-B	Stewart-Warner	Heater (200000 BTU)
97	6041H-146A	Cutler Hammer	Relay (B-12)
22	0655-D	Aro	Oxygen Regulator
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384	564-2A	Eclipse	Oil Separator

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56	48392	Sump
390	48461	Gear
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SHORTLINES

► **Air France** plans jet service with three Comets starting in June. General manager Henri J. LeSieur says the jet medium-range service, combined with short-haul turboprop Viking service in Europe, and long-range Turbo-Compound DC-7 will make the Air France fleet the world's most modern.

► **Air Transport Assn.** has appointed John A. Lundmark, former TWA sales agreements manager, as secretary for committees of the Air Traffic Conference.

► **Braniff International Airways** president Tom Braniff has been named Dallas Salesman of the Year by the Dallas, Tex., Sales Executives Club. . . . Has CAB approval of non-stop service between Tulsa and Chicago.

► **British Overseas Airways** contract with Lockheed Aircraft Service to modify two newly acquired Constellations to trans-Atlantic coach calls for 70 passenger seats, with the 14 aisle seats removable and the first six rows of all seats capable of folding against the wall to allow cargo space. . . . Is increasing its Stratocruiser luxury service New York-Nassau from three to five flights weekly. Fourth flight will be added Jan. 28, fifth flight Feb. 3.

► **Civil Aeronautics Administration** has issued a new booklet outlining all aspects of airport planning. . . . Has diverted $2.5 million from other projects to make Wake Island facilities "typhoon-proof."

► **Helicopter Air Service** on Dec. 24 completed 20,000 hours of accident-free flight with its fleet of Bell copters flying shuttle between Chicago Post Office and Midway Airport. HAS inaugurated service Aug. 20, 1949, has flown 1,075,000 miles, carried 9,420,000 lb. of mail and had a performance factor of 95.7% during the period.

► **Mackey Air Transport, Inc.,** this month began twice daily DC-3 service Nassau, Bahamas-Ft. Lauderdale and West Palm Beach, Fla., connecting with northbound and southbound flights of National Airlines and Eastern Air Lines.

► **Northwest Airlines** has concluded an agreement with Eastern Air Lines for lease of Super Constellation equipment for NWA's Chicago, Twin Cities-Pacific Northwest routes. New equipment will add about 9.2 million seat-miles per month, NWA says. Company's Stratocruisers also are being fitted with eight more seats to provide about 4 million additional seat-miles per month.

► **Pan American World Airways** reports its U.S. Latin America passenger volume gained 7% to 835,000 revenue passengers in 1952.

► **Sabena Belgian Airline** reports its helicopter mail service schedule regularity last year was 97.3%, with on-time performance 100% of eight cancellations in 299 days, fog caused six and high winds one. The eighth was not explained. Sabena uses three Bell 47D1s.

► **Seaboard & Western Airlines** reports a record-high November of 2,990,133 revenue ton-miles, 53% more than 1951.

► **Trans-Canada Air Lines** set a new record of 27.3 million revenue miles in 1952, up 13% over 1951. . . . Airline carried approximately 1,125,000 passengers on its North American and international routes, an increase of 20% over 1951. . . . At year's end TCA's fleet included 23 DC-4 North Stars and 27 DC-3s.

► **Transocean Air Lines** claims a new Honolulu-Oakland speed record, 7 hr. 28 min. for the 2,412-mi. trip with a Royal Hawaiian DC-6B. Scheduled time is 9¼ hr. Plane was aided by a 100-mph. tailwind.

► **Trans World Airlines** has started five trans-Atlantic roundtrips a week with luxury 32-passenger Constellation "sleeper-seat" service. . . . Company reports a record 2,310,000,000 passenger-miles for 1952, 23% more than 1951. Trans-continental coach alone gained 129% to 582 million passenger miles. December total traffic gained 33% more than 1951 to 162 million.

► **United Air Lines** has a Presidential Emergency Board recommendation for flight engineer wage increases ranging from $54 to $120 a month. The presidential board denied the union request for an incentive formula system that would have put the engineers up near pilot pay levels. The board was set up after the flight engineers staged a six-day strike in November.

► **U.S. Airlines** has CAB exemption to fly military personnel on furlough. U.S. is a certificated all-cargo line.

► **Western Air Lines** has ordered three more DC-6Bs, making a total of eight. Recent CAB award of Minneapolis-West Coast route is believed partially responsible for the decision.

STRICTLY PERSONAL

THE AIRPORT ENGINEER

Clarence M. Shy, manager of Stockton, Cal., Field, delivered of himself some doggerel that must have made him and a lot of other airport engineers feel better. Listen to Clarence and weep:

* * *

The role of airport engineer is not an easy task; you listen to suggestions and to questions people ask: "What's the matter with the wind-tee, it wasn't lit last night?" When are you going to relamp that southeast boundary light? Don't you think it would be better with a smoke-pot on the ground than a wind-sock on the hangar?"

"Will you move that little mound which is out there on the runway, right near the landing mat? Are those little pools of water there because the field is flat? Who the dickens is your gardener, don't he ever use a rake? What's the matter with the drainage? This field is like a lake. This drinking water's terrible, it seems to have a taint. It looks as if your hangars need a brand new coat of paint. I couldn't find the beacon coming over the hill last night; that green's a lousy color; you ought to make it white.

"Will you ever fix the apron outside the hangar door? Seems to me we've asked you 'bout 20 times or more. Why don't you oil the runways and keep that dam dust down? Those flush-type boundary lights of yours are too close to the ground.

"Who's gonna clean my ship today? It's spattered up with oil. What you really need's a real good growth of weeds to hold the soil. Our office door is broken, will you have it fixed? I'd like to get some asphalt next time you have some mixed.

"Can I take home some flowers? My apartment is so bare; sweet peas are my favorites. I'll take those large ones there. How about a roof sign? The cost can't be so high; what—20 bucks? That's pretty steep; we'll kiss the sign goodbye. This hangar roof is leaking; our office is a sight, we'd like to have you paint it when we've gone home some night. Venetian blinds are what we need to kill this awful glare; install an elevator, cut out this lousy stair. Whoever built this airport didn't know his onions; it ought to swivel with the wind if you mount it up on trunnions.

"And so it goes, day after day, requests and questions by the pile, but all the engineer can do is smile a very sickly smile."

* * *

HIGH-SPEED VENTILATION

AVIATION WEEK's **George Christian** reports this case of "nonchalance sans pareil" aboard a pressurized, four-engine airliner recently. Somehow a hole was torn in the junction of the floor and the fuselage side and one shoe of a woman passenger sitting in the front row of seats was sucked off her foot. Casually glancing at her denuded foot, she commented to her companion that she was fortunate to have several pairs along. It was fully half an hour later before the cabin attendants learned about the situation—when the lady requested another seat "because of the draft."

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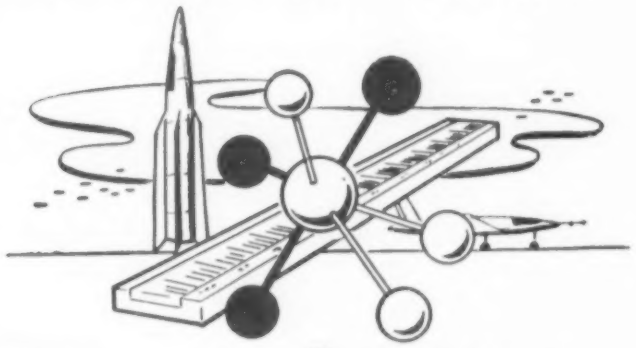

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EDITORIAL

More Reforms Needed at CAA

We congratulate Civil Aeronautics Administrator Charles Horne for transferring William B. Davis from an important post in the Washington office of CAA to a minor berth in the Kansas City region. The move comes a year late, but at least it is in the right direction, although Mr. Davis triumphantly retains his Grade 15 Civil Service status and salary. (Story on p. 16).

Mr. Davis has been deputy director of the vital Office of Aviation Safety. With his chief, Ernest Hensley, he has been a storm center since they maneuvered a notorious and costly "reorganization" of CAA safety offices early last year. In the process, several well-respected CAA public servants were banished to the sticks—as Mr. Davis is being banished now—and other cronies of Messrs. Hensley and Davis were elevated to jobs that were too big for them. We hope someone does something about these unfortunates before long.

Rumors are rampant that Mr. Hensley is looking for quieter regions, too. For his sake, and that of aviation safety, we hope so. There are reports that Leonard Ashwell, deputy chief of the Air Carrier Division of OAS, may replace Hensley. But the Eisenhower Administration may inherit this decision.

We hope Gen. Eisenhower will give CAA a close scrutiny and a strong Administrator.

The close scrutiny should take in the present so-called "regional" organization structure. This was sold to a previous Administrator under the guise of "decentralization." It has long since become clear to most of us that this setup, far from constituting decentralization, is actually centralization in 11 headquarters instead of one.

What were intended to be small, decentralized "housekeeping" regions have become 10 colossal autocracies, each a separate CAA in itself, complete with administrators, deputy administrators, assistant administrators, executive assistants, planning and procurement officers, and so forth, with salaries of $10,000 and above, generously scattered over the countryside.

These 10 separate CAAs frequently place different interpretations upon Washington instructions and policies, with the result that safety standards, procedures, and the like, vary widely between and among regions.

For example, the First Region required Pan American's Atlantic Division to utilize navigators on flights between New York and San Juan, while the Second Region authorized the same airline's Latin American Division to fly the same route with the same aircraft without navigators.

The Sixth Region authorized airlines headquartered in that region to use commercial radio broadcasting stations for navigational and instrument letdown facilities while other regions denied airlines headquartered in their regions the right to use the same stations for the same purposes.

One region will authorize an airline to fly into an airport when the weather is 200-ft. ceiling and one-half-mile visibility, while another region will insist that their airlines operate into the same airports with weather minimums of 300-ft. ceiling and three-quarters-of-a-mile visibility. So it goes.

Controversies arising subsequent to such differences are seldom settled because none in the CAA except the Administrator has any real authority—technical or otherwise—over a regional administrator, and no Administrator could become familiar with the details of all such rhubarbs which occur during their comparatively short tenures in office.

The airlines as a group made strong exhortations to former Administrators Wright and Rentzel to take airline inspection out of the regions. Both were sympathetic but were persuaded by the regional administrators that the ills complained of could and would be rectified by "reorganizations," which, while accomplishing the desired ends, would still retain regional "integration."

These "reorganizations," with many resounding references to "system-wide" air-carrier inspection, were strictly lip service and camouflage, seasoned and respected CAA people tell us, and the Old Guard kept their tight grip on airline inspection and kept it divided among their regions. They also kept it married, in the shotgun manner, to the old General Inspection crowd, because that made it possible for the clique to keep their stooges in the top supervisory positions whether or not they have any background experience or talents which qualify them to "supervise" airline inspection.

Under Messrs. Hensley and Davis, neither of whom knows anything about modern airline operation or inspection, the situation has grown steadily worse until the whole OAS is floundering in its own red tape, confusion and inadequacies.

It is a sure bet that lip service and "reorganizations" will no longer suffice to quiet the angry protests, and that airline inspection will soon be divorced from regional boundaries and regional supervisors—and from Messrs. Hensley and Davis.

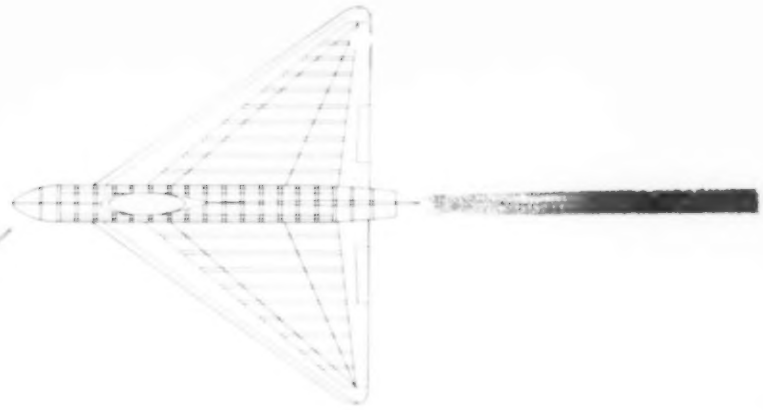
Men in the airlines and CAA whom we respect believe that one high-calibre inspector should be placed in full charge of the inspection of each airline, and that his assistants, stationed where he needs them, will work solely for and report directly to him. He, in turn, will report to one man at CAA headquarters.

And they say that airline inspection is sufficiently important to be set up directly under the Administrator, with no thick layer of amateurs between.

The whole concept of airline inspection, these men say, should be changed from the Hensley-Davis unenlightened, stereotyped, paper-shuffling variety to a realistic and intelligent minimum of actual inspection of vital safety functions.

A small, integrated group of qualified individuals with clean-cut lines of authority and responsibility, guided by a minimum of clearly stated standards and policy, could soon dispel the confusion and put an abrupt end to the vacillating and buck-passing so prevalent among and between the 10 regions and their innumerable strata of "supervisors" who accept responsibility for nothing, yet have authority over everything.

—Robert H. Wood



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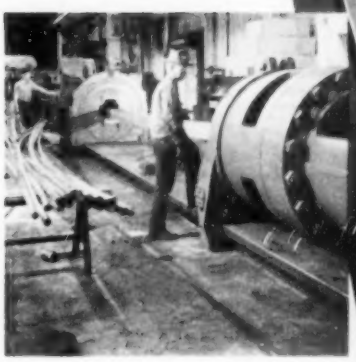

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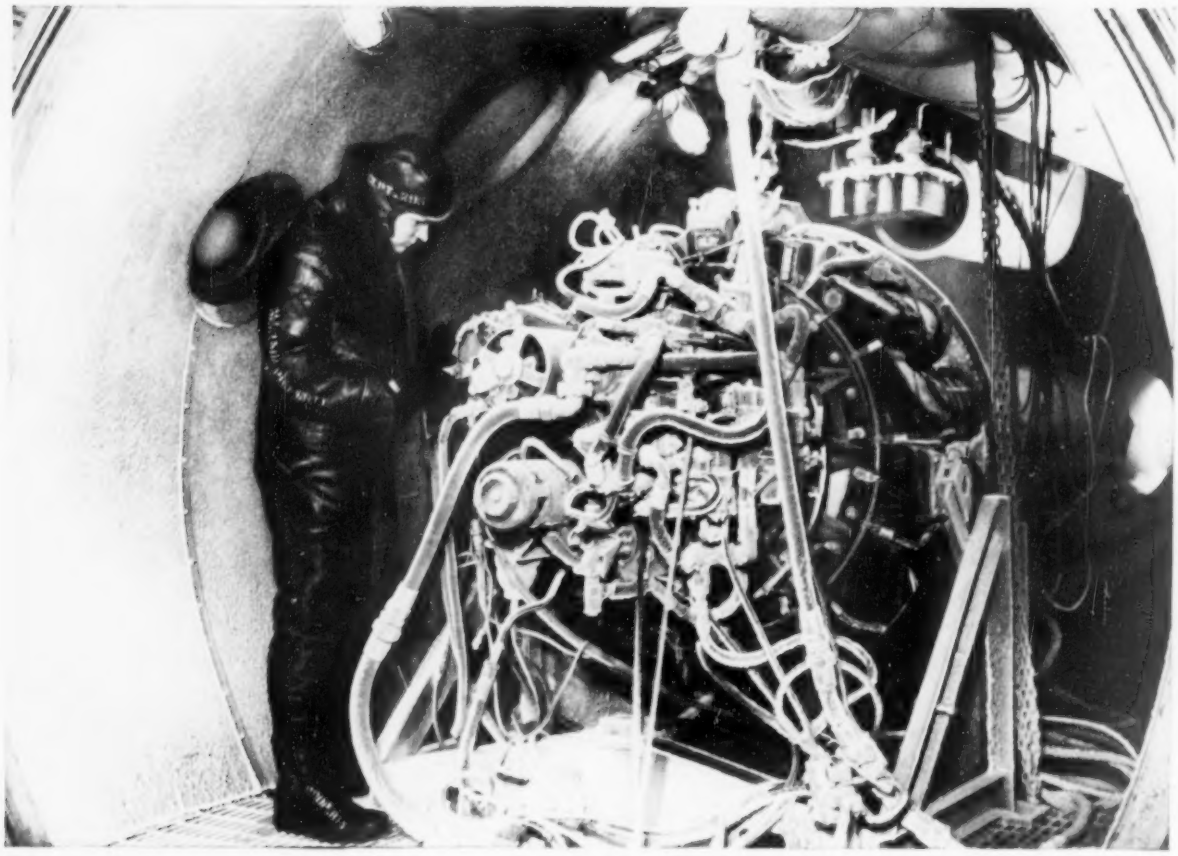

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Up in jet country—10 miles above the earth—it gets mighty cold.

Even when these planes are operating only two or three miles up, temperatures drop below zero. And when they reach their ceiling, the thermometer stands at about minus 67 degrees F.

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In the low-temperature-starting test chamber shown above, designed and built by Allison, the toluol (can't use mercury at these low temperatures) drops to 100 degrees below zero—far colder than the lowest temperature the jets will ever encounter. And prior to these tests of the complete engine, we check the various systems and parts to be sure that they will perform properly under the most severe atmospheric conditions of temperature, altitude, humidity—even including exposure to sand, fungus and salt spray.

In addition to these laboratory tests, our engineers are assigned to anti-icing tests of Allison engines at Mt. Washington, New Hampshire, cold-starting tests at Ladd Air Force Base, Alaska, and low-temperature tests of the complete airplane in the huge cold chambers at Eglin Air Force Base, Florida.

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